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PREFACE

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behind the vaginal orifice and in front of the anus to form the Posterior Commissure. In the woman who has borne children the posterior commissure is usually flattened out and has become invisible. The labia majora are covered on their outer sides by hair. Their mesial aspects are in contact, except when the legs are separated, and are covered by moist skin.

Labia Minora.—These are two narrow folds of integument lying one on each side of the midline just within the labia majora. When pendulous they hang below the labia majora, but ordinarily they are concealed by the larger folds. They are covered by moist skin and their lower free margins are often crenated like a saw. In front the labium minus on each side splits into two folds. The upper of these unites above the clitoris with the corresponding fold of the other side to form the *Prepuce* of the clitoris. The lower folds unite below the clitoris to form the *Frenum*.

Behind, the labia minora unite across the middle line behind the vaginal orifice to form the *Fourchette*, a skin fold which, when the parts are separated, is thrown into a sharp edge. In women who have had children the fourchette is apt to disappear. In front of the fourchette, between it and the vaginal orifice, is situated the depression called the *Fossa Navicularis*.

Clitoris.—This is the homologue of the penis, and to the male organ it has some resemblance. It is situated in the midline just below the anterior commissure. It projects as a small elongated structure, capped, like the penis, by a rounded glans, which is very sensitive to touch. In any examination of the vulva it is important to avoid touching the clitoris.

All the structures outside and including the labia minora are covered by skin. Internal to the labia minora the surfaces of the vulva are clothed by mucous membrane of the squamous type.

The Vestibule and External Meatus Urinarius.—The Vestibule is a triangular area covered by mucosa. Its apex is above at the clitoris and its base below at the front margin of the hymen, whilst laterally it is bounded by the labia minora. Centrally, placed at the base and about 1 inch below the clitoris, is the external urethral orifice, which lies in the middle of a small puckered hillock of mucous membrane.

The vestibule is only visible when the labia are drawn apart. In the natural condition the mucosa of the vestibule is folded

on itself so that the triangular area becomes a slit, at the lower end of which the urethral opening is concealed.

The Hymen and Vaginal Orifice.—The Hymen consists of a septum of mucous membrane closing over the vaginal orifice. In reality the hymen is composed of two lateral folds like diminutive labia, which are united above and below, and which, when the legs are apposed, lie one against the other. Between them is situated the narrow slit of the vaginal orifice, which has its long axis running from behind forwards.

The vaginal orifice varies considerably in different individuals. In some the opening in the hymen is very small and tight or even absent. In other individuals the hymeneal orifice, though virginal, may be large. In still other cases there may be more than one opening; the hymen is then said to be cribriform. With the consummation of marriage the hymen is torn or is opened widely. When torn the lacerated edges remain as a series of projecting tags of mucosa, the *carunculae myrtiformes*. This is the condition that obtains in all cases after the birth of the first child.

It is to be noted that, from the medico-legal standpoint, coitus does not necessarily cause rupture of the hymen, for it is known that pregnancy may be found though the hymen is apparently intact. In these cases insemination has occurred without penetration, or the penetration has been so partial or the hymen so resilient that rupture has not taken place.

The Perineum.—This forms the skin area measuring about 1½ in. that extends between vagina and anus. After the birth of a child, as the result of rupture or of stretching, the perineum may be shortened so that vagina and anus come nearer one another. The *perineal body* consists of the mass of muscular, fibrous, and fatty tissue that separates the lower ends of the vaginal and anal canals. On section it is triangular, with its base below, where it is covered by the skin of the perineum, and its apex above. Its length from above downwards is about 1½ in. (Fig. 2).

INTERNAL GENITAL ORGANS

The internal organs of generation consist of

The Vagina.	The Fallopian Tubes.
The Uterus.	The Ovaries.

VAGINA

The vaginal canal commences below, where in the virgin it is partly closed by the hymen. It extends upwards and backwards to the vaginal vault parallel to the plane of the pelvic brim, and in the erect position, therefore, makes an angle of 60° with the horizon. The vagina expands somewhat at the vault to receive the vaginal portion of the cervix uteri, which projects downwards and backwards into it as a cone. The mucous membrane of the vagina is reflected all round on to the base of the cone to become continuous with the mucosa which envelops the outer surface of the cervix.

The annular depression in the vaginal vault surrounding the cervix is divided arbitrarily into four regions or *fornices, anterior, posterior, and two lateral.* This description is made use of in describing the position and relationship of the structures felt through the vaginal vault during an examination with the fingers. Such and such a structure or condition is said to be felt through the anterior or posterior or right or left lateral fornix. The angle of insertion of the cervix into the vagina is such that the anterior vaginal wall is shorter than the posterior wall. This gives to the examining finger the impression that the posterior fornix is deeper than the anterior. The anterior vaginal wall measures 3 in., the posterior wall 4 in.

Structure

The vagina is lined by squamous epithelium. It is not smooth but is thrown into folds. A longitudinal fold passes mesially along both anterior and posterior wall, and from these transverse rugae extend to the sides of the vagina. These folds are especially evident in the infant. They are often specially marked on the lower part of the front wall. They tend to become permanently flattened out during labour.

The mucosa contains no glands. Despite this the vaginal walls are always moist, being lubricated by the secretion of the uterine mucous membrane or by a fluid transuding through the epithelial lining of the vagina.

The vagina is a fibro-muscular tube. External to the mucosa there is a complete sheath of fibrous and non-striped muscular tissue.

The *relations* of the vagina are important (Fig. 2). *In front* it is related in its lower part to the urethra, which towards its termination is actually imbedded in the muscular wall of the vagina. Above this the anterior wall is closely related to the bladder. *Behind*, the vagina is related to the following structures from below upwards: lower third, perineum; middle third, rectum; upper third, peritoneum. The finger placed in the posterior fornix is separated from the pouch of Douglas only by the thin septum formed by the vaginal wall and the peritoneal lining. The *lateral fornix* on each side lies below the connective tissue which surrounds the cervix. Just above this fornix on each side the ureter passes forwards to the bladder across the base of the broad ligament, and, when it is expanded or thickened, it may be felt in this part of its course by the finger pressed deeply upwards into the lateral fornix. The *lateral wall* of the vagina is related to the levator ani muscle. The vaginal canal passes between the two levator ani bellies, which on each side ensheathe and support it. The intimacy of this support is increased by the fact that at their free edge the fibres of the muscles are carried on to, and actually take part in the formation of, the outer muscular layer of the vagina.

Blood-Supply.—The upper part of the vagina is supplied by the vaginal branch of the uterine artery on each side, the middle part by branches of the inferior vesical, and the lower part by twigs from the internal pudic and middle haemorrhoidal arteries. The veins accompany their respective arteries.

Lymphatics.—The lymph vessels from the upper two-thirds drain into the iliac, from the lower third into the superficial inguinal glands.

FIG. 2.—Median Sagittal Section through the Female Pelvis, showing the relations of the viscera and the arrangement of the peritoneum, which is indicated in blue. The cut edges of the peritoneum are represented by the dark blue lines.

1. Caecum.
2. Round ligament of uterus.
3. Ovary.
4. Uterine (Fallopian) tube.
5. Uterus.
6. Cervix uteri.
7. Bladder.
8. Urethra.
9. Vagina.
10. Rectum.
11. Anal canal.

From "Medical Applied Anatomy," by T. B. Johnston, M.B.

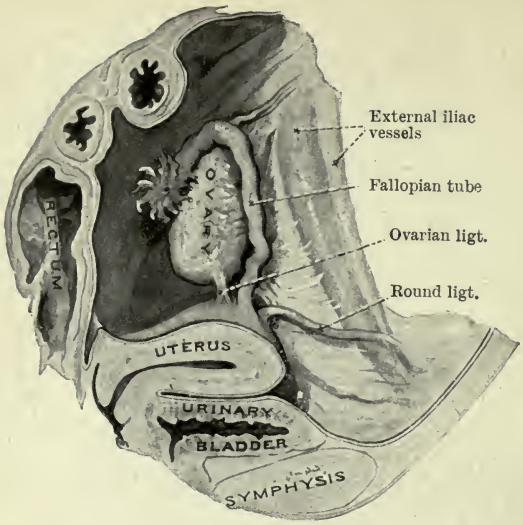

FIG. 3.—Sagittal Mesial Section of the Female Pelvis.

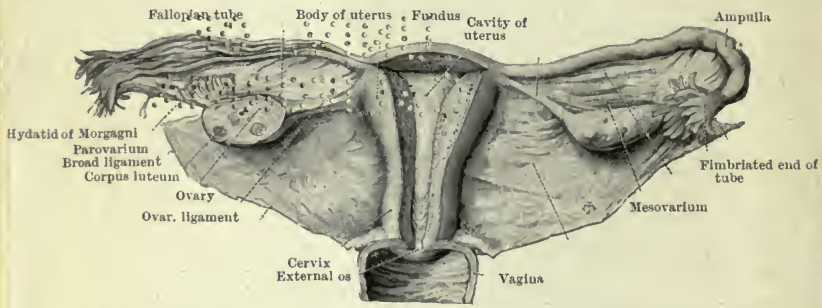

FIG. 4.—The Uterus and the Appendages from behind. The uterus and the left tube are laid open.

From Cunningham's "Manual of Practical Anatomy" (Oxford Medical Publications).

CHAPTER II

UTERUS—UTERINE LIGAMENTS—PELVIC FLOOR

UTERUS

THE uterus is a pyriform muscular organ which occupies a central position in the pelvis and projects into the peritoneal cavity by its rounded and larger part—the **corpus or body.** Its lower and narrower part, the **cervix or neck,** is cylindrical and projects into the vault of the vagina. The point where the narrower cervix joins the body is called the **isthmus.** The uterus encloses a cavity lined by mucous membrane, which above is continuous with the canal of the Fallopian tube, and thence with the general peritoneal cavity, and below is continuous at the external os with the cavity of the vagina (Figs. 5 and 6).

Under ordinary conditions the upper end of the uterus is placed just below the plane of the pelvic brim, and the external os at the level of the ischial spine. The organ, however, possesses a considerable latitude of movement in health. This is especially the case in the antero-posterior direction. Distension of the bladder may readily lift it backwards, whilst a loaded bowel may, on the other hand, press it forwards. So it shares in the up and down movements which the abdominal viscera have imparted to them during respiration.

The uterus is tilted from the vertical so that its general axis coincides more or less with the axis of the pelvic inlet, *i.e.* it is anteverted. It is, moreover, so bent that the body and cervix form an angle which is obtuse forwards, *i.e.* the uterus is anteflexed. **Anteversion** and **anteflexion** is the normal state of the uterus (Fig. 3).

The *measurements* of the uterus are : length, 3 in. ; breadth

at its upper part, 2 in.; antero-posterior thickness, 1 in. Of the total length the body takes 2 in., the cervix 1 in. The length of the cavity from the external orifice to the top of the uterus is 2½ in.

Corpus Uteri

This has the shape of a pear flattened from before backwards and with the expanded end above. The anterior surface is less convex than the posterior. The Fallopian tube opens into the body on each side near the upper end. Just below and in front of this on each side the *round ligament* is attached, and behind, at a similar level, the *ovarian ligament* (Figs. 4, 5, and 6).

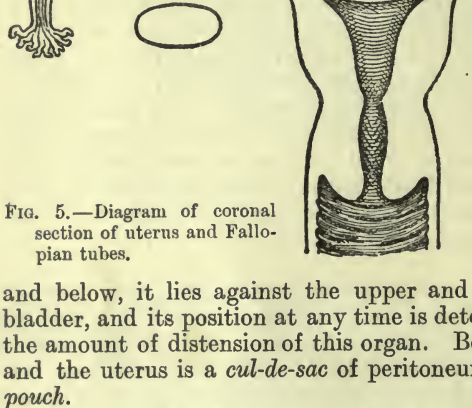

Fig. 5.—Diagram of coronal section of uterus and Fallopian tubes.

The region of the uterus above the level of the tubal openings is called the *fundus*.

Relations.—The body is movable within considerable limits. In front and below, it lies against the upper and back part of the bladder, and its position at any time is determined largely by the amount of distension of this organ. Between the bladder and the uterus is a *cul-de-sac* of peritoneum—*the utero-vesical pouch.*

Behind and above the body carries on its back the coils of small bowel and sometimes of large bowel which occupy the pelvis.

Structure.—The body consists of an outer coat of peritoneum, an intermediate wall of muscle, and an internal lining of mucosa.

Peritoneum.—This covers the body entirely except along a thin strip on either side, where the peritoneum is carried out as a narrow fold to the side wall of the pelvis—the *broad ligament.*

Muscular Wall.—The main mass of the body is composed of the muscular wall of unstriped muscular tissue. This is said

to consist of an outer longitudinal coat, an intermediate coat of irregularly interlacing fibres, and an inner of circular fibres. The thickness of the muscular wall is about ½ in.

Cavity.—The cavity of the body ordinarily consists of a mere slit as seen in a longitudinal sagittal section, for the

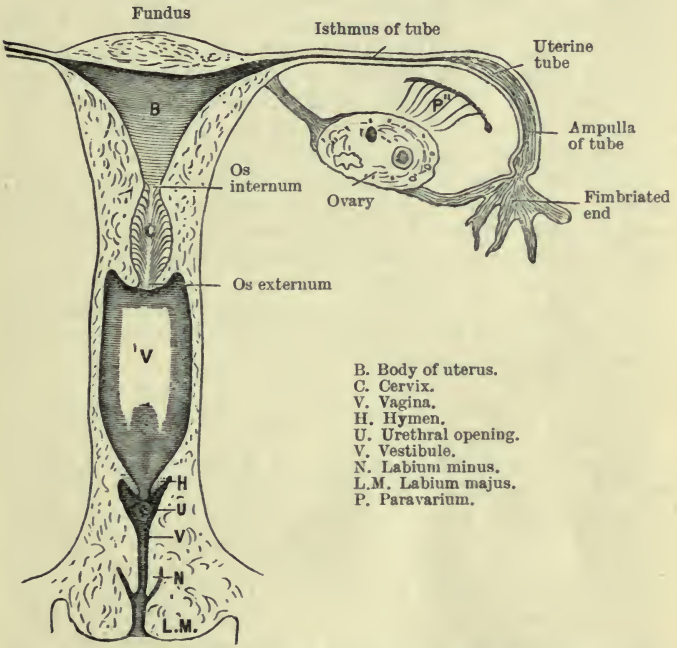

Fig. 6.—Diagram of the vulva, vagina, and the uterus with its appendages. (Symington.) From Cunningham's *Manual of Practical Anatomy.*

anterior and posterior walls are in contact. On coronal section the corporeal cavity is triangular with the base above and the apex below at the *internal os*, where the canal narrows before entering the cervix. At each end of the base or upper part of the cavity the tubal orifices are seen to open. These lateral regions of the fundal area of the body are often called the *cornua* (Figs. 5, 6, and 8).

Mucous Membrane or Endometrium.—The cavity is lined by mucous membrane, which is composed of stroma and epithelium. The **stroma** consists of branching embryonic connective tissue cells. On its inner aspect it is covered by a continuous layer of columnar ciliated epithelial cells, and it is channelled by numerous simple tubular **glands** which open out on the surface and are lined by an epithelium similar to the covering epithelium. The glands extend throughout the entire thickness of the stroma, running approximately at right angles to the surface. Their deep ends terminate blindly amongst the superficial layers of the muscular coat of the uterus, each end being clothed by a small amount of stroma (Figs. 7 and 12).

In the endometrium there is a specially rich capillary supply, which is derived from vessels that traverse the muscular wall to reach the mucosa. The healthy endometrium has no fully formed fibrous tissue nor has it any elastic tissue.

The stroma is throughout a very soft, labile tissue, a feature that has its physiological counterpart in the ease with which the mucosa becomes flushed with blood during menstruation and pregnancy.

Cervix Uteri

This commences above at the level of the isthmus and ends below in a conical portion which projects into the vagina. Its total length is 1 in. The upper part is cylindrical and is called the *supravaginal portion.* The lower part is conical; it is directed downwards and backwards into the vaginal vault, and is called the *vaginal portion* (V.P.) (Figs. 2 and 8).

The supravaginal portion is in loose contact in front with the bladder, separated from it by a fine intervening layer of connective tissue. This loose relation between bladder and cervix is an important fact in some operative procedures on the cervix. Behind, this part of the cervix is covered by peritoneum and is related to the pouch of Douglas (Fig. 2). The supravaginal portion is enclosed by that part of the pelvic connective tissue which is specially devoted to the support of the uterus, the *parametrium.* The ureter on each side traverses this connective tissue in a downward, forward, and inward direction to reach the bladder, and is only about $\frac{3}{4}$ to $\frac{1}{2}$ inch from the supravaginal portion of the cervix (Figs. 9 and 10).

FIG. 7.—Mucous Membrane of Uterine Body.

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The vaginal portion, in a woman who has had no children (nullipara), is shaped like a cone with a small circular opening at the summit—the *external os.* In a woman who has borne children (unipara or multipara) the os is usually opened out and transverse (Fig. 12). In many cases this is associated with a split or laceration on one or both sides extending into the adjacent cervix. The area in front of the os is called the *anterior lip* ; the area behind, the *posterior lip.*

Fibromuscular Wall of Cervix.—The cervix is firmer than the

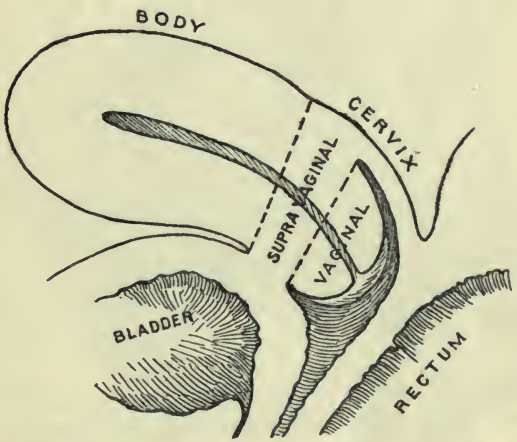


FIG. 8.—Diagram showing how the cervix is divided into vaginal and supravaginal portions.

body because of the larger admixture of fibrous tissue in its wall. There are scattered bundles of unstriped muscle. *The cavity* of the cervix is shaped like a spindle, the ends contracting above at the internal os and below at the external os. These orifices are narrower in the nulliparous woman, becoming permanently opened out after pregnancy.

Mucous Membrane.—This is ridged and furrowed. A longitudinal central fold runs the length of the anterior and also of the posterior wall, and from these two folds a series of transverse ridges passes outward to encircle the cavity.

The appearances of the mucosa of the cervix differ from

those of the endometrium. The epithelium lining the cavity and the glands consists of long thin columnar cells closely packed together with nuclei pushed right up against the

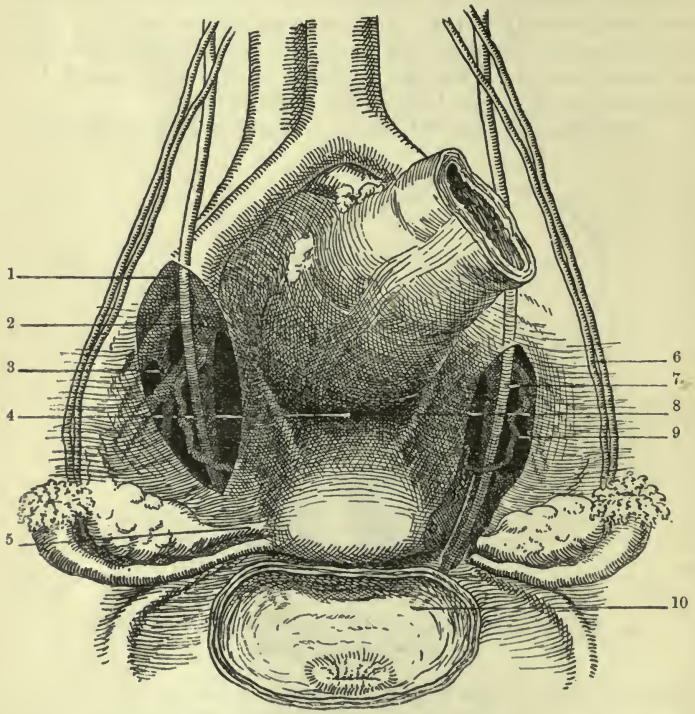


FIG. 9.—Showing relation of pelvic structures.

1. External iliac artery.
2. Internal iliac artery.
3. Internal iliac vein.
4. Pouch of Douglas.
5. Ovarian ligament
6. Ovarian vessels.
7. Ureter.
8. Utero-sacral ligament.
9. Uterine artery.
10. Bladder.

basement membrane. This type of epithelium is sometimes called palisade epithelium. The glands are racemose, *i.e.* each tube breaks up into a cluster of terminal tubules. The stroma is dense and fibrous (Fig. 11).

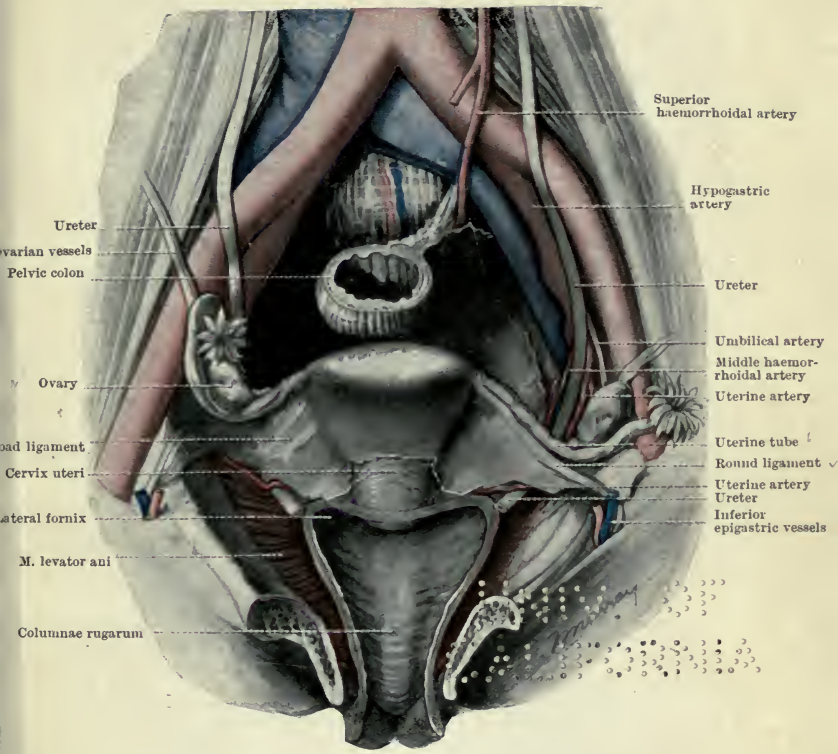


FIG. 10.—Dissection of the Pelvis. The Uterus has been pushed backwards, and the Bladder, the lower part of the Ureters, and the anterior wall of the Vagina have been removed.

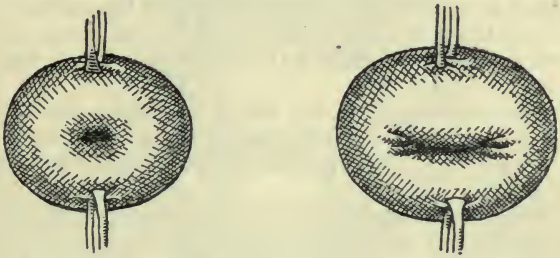
From Cunningham's "Manual of Practical Anatomy."

FIG. 11.—Diagram showing the nature of the mucous membranes of the body of the Uterus, the Cervix, and the Vagina.

Blood-Supply of Uterus.—This is from two sources, (1) the uterine artery, a branch of the internal iliac, (2) the ovarian artery, a branch of the abdominal aorta (Fig. 14).

The uterine veins join the internal iliac veins. The right ovarian vein joins the inferior vena cava, the left the left renal vein.

Lymphatics of Uterus.—The lymph vessels from the upper part of the body run with the ovarian lymphatics to the lumbar glands. A few from the fundus run along the round ligament to the inguinal glands. The lymphatics from the



Nulliparous cervix. Parous cervix.

FIG. 11.

lower part of the body and the cervix empty into the hypogastric glands, which lie in a bunch between the external and internal iliac vessels.

Nerves of Uterus.—These are derived chiefly from a sympathetic plexus situated in the proximity of the cervix. In addition to the sympathetic supply, the uterus has a cerebrospinal supply through the third and fourth sacral nerves.

FACTORS RESPONSIBLE FOR POSITION OF UTERUS

The factors which maintain the uterine position are:

(*a*) Ligaments.
1. Broad.
2. Round.
3. Utero-sacral.
4. Transverse Cervical.

(*b*) Pelvic Floor, especially the levator ani muscle and the pelvic fascia.

It is apparent that the above ligaments and the pelvic floor have wider functions to perform than that of merely holding the uterus in place. Either directly or indirectly they share in maintaining the normal statics of the pelvis, and in this way they are concerned with the support of the other pelvic viscera —ovary, tube, vagina, bladder, and rectum. It is convenient, however, for purposes of description to consider them at this stage.

UTERINE LIGAMENTS

Broad Ligaments and Infundibulo-pelvic Ligaments.—These constitute the chief ligamentary support of the uterus, and their natural forward tilt confirms the anteversion which the uterus possesses (Fig. 13).

Round Ligaments.—These tether the uterus forwards, but their main action is probably not so much to hold the uterus in its forward position as to restrain any tendency to backward displacement (Fig. 13).

Utero-sacral Ligaments.—These pass upwards on each side from the back of the uterus in the region of the isthmus to the third portion of the sacrum. They swing the uterus from the back wall of the pelvis, and their lines of attachment and traction confirm the anteversion of the uterus (Fig. 13).

Transverse Cervical Ligaments.—These are not specialised ligaments, but consist of the fibrous tissue, which ensheathes the uterine vessels, and which, passing from the side wall of the pelvis to the uterine isthmus, constitute on each side important supports.

In addition to the above supports the strong **pubo-vesical ligaments,** by sustaining the bladder, exert an important influence in holding up the other pelvic viscera.

PELVIC FLOOR

The pelvic floor consists of the curtain of soft parts which closes in the outlet of the bony pelvis. It comprises all the structures from peritoneum on the inner aspect to skin on the outer aspect, but the two most important elements from the point of view of support are the pelvic fascia and the levator ani muscle.

The pelvic viscera—bladder, uterus, and rectum—are laid on the upper aspect of the pelvic floor, and they channel it by

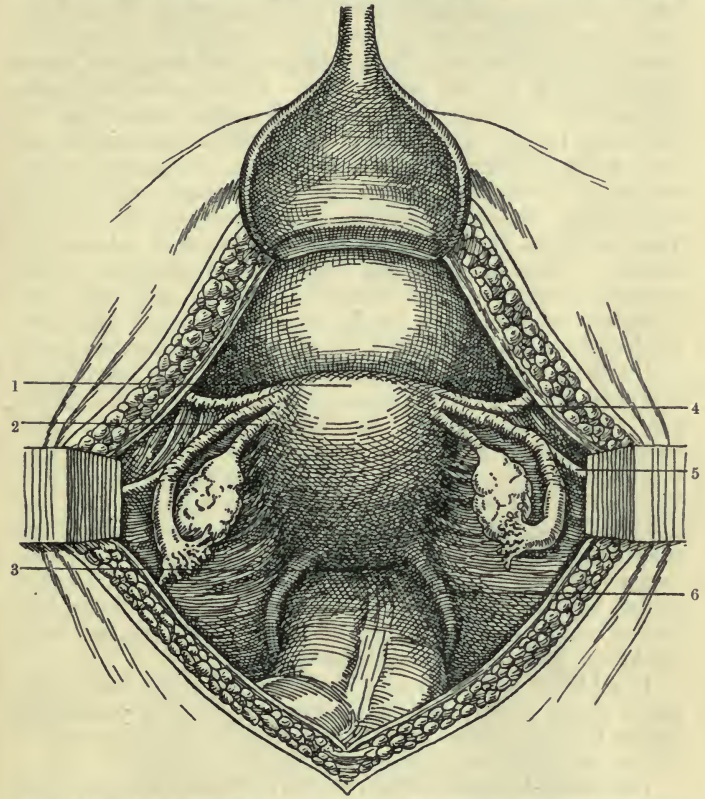


FIG. 13.—View of the female pelvis as seen during an abdominal operation.

1. Fundus uteri.
2. Ovarian ligament.
3. Pouch of Douglas.
4. Round ligament.
5. Infundibulo-pelvic ligament.
6. Utero-sacral ligament.

means of their canals—urethra, vagina, and anal canal—to reach the outer surface. The external generative organs are built on to the outer aspect of the pelvic floor.

Pelvic Fascia.—This consists of the extraperitoneal fascia of

the abdominal cavity, which sweeps down all round into the pelvis. Just below the pelvic brim it splits on all sides into two layers—the parietal and the visceral layers. The *parietal layer* continues its course downwards, closely hugging the pelvic wall and clothing the inner aspect of the muscles, which are attached to the pelvic wall. Thus, laterally, it lies against the obturator internus muscle and is here called the obturator fascia. The *visceral layer* sweeps downwards and inwards all round in the form of a basin, clothing the upper surface of the levator ani and coccygeus muscles and sending ensheathing prolongations round and between the viscera. Thus, in front, it covers the upper surface and sides of the bladder. Anteriorly to the bladder it is attached to the posterior surface of the symphysis pubis, and it is here thickened to form two bands—the pubo-vesical ligaments. Behind the bladder it sends a sheath between it and the cervix and vagina. It ensheathes the upper part of the vagina and is carried upwards in the form of a fingerless glove to embrace the uterus. Laterally to the uterus it fills up the space between the layers of the broad ligament. Below these ligaments it encloses the supravaginal cervix and the vagina. This part is called the *parametrium*. It is specially thickened round the uterine vessels, where it has an admixture of unstriped muscular tissue, to form the transverse cervical ligaments. Between vagina and rectum it passes as a septum, whilst, behind, it encloses the rectum. The utero-sacral ligaments are specialised thickenings of the visceral layer reinforced by bands of non-striped muscle.

In addition to ensheathing and supporting the viscera, the pelvic fascia forms the bed in which the pelvic vessels and nerves lie and, where it splits into two layers, it provides a line of origin for the levator ani muscle.

Levator Ani Muscle.—With the pelvic fascia this is the most important constituent of the pelvic floor (Figs. 16, 17, 18).

It consists of a broad sheet of muscle on each side, which stretches downwards and inwards from the pelvic wall and, fusing with its fellow of the opposite side, or striking down to be attached to the outer aspect of the pelvic floor, it forms a diaphragm of muscle which, with the coccygeus muscles behind, almost completely closes over the pelvic outlet.

Its *origin* is the lower aspect of the pelvic fascia where this

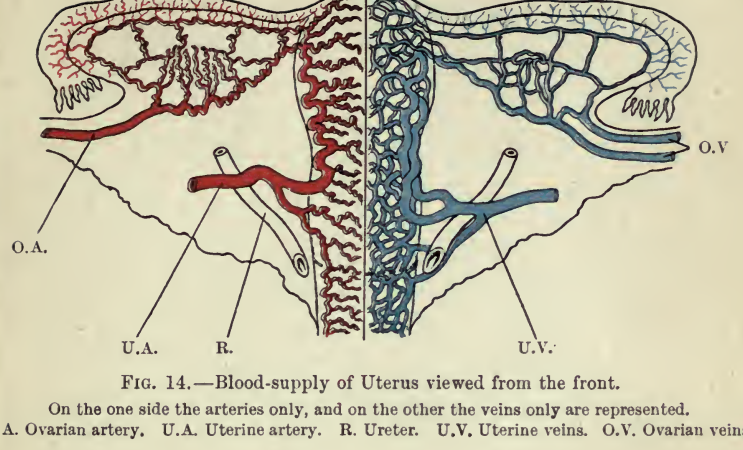


FIG. 14.—Blood-supply of Uterus viewed from the front.

On the one side the arteries only, and on the other the veins only are represented.
O.A. Ovarian artery. U.A. Uterine artery. R. Ureter. U.V. Uterine veins. O.V. Ovarian veins.

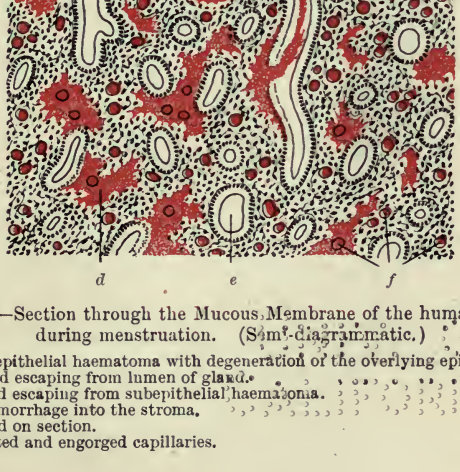


FIG. 15.—Section through the Mucous Membrane of the human Uterus during menstruation. (Semi-diagrammatic.)

a. Subepithelial haematoma with degeneration of the overlying epithelium.
b. Blood escaping from lumen of gland.
c. Blood escaping from subepithelial haematoma.
d. Haemorrhage into the stroma.
e. Gland on section.
f. Dilated and engorged capillaries.

splits into two layers. Along this line of fascial fission the muscle gains its origin as far as the back of the pubic body in front, and as far as the ischial spine behind.

Its *insertion* is the central point of the perineum, the angle behind the rectum, where this bends backwards into the anal canal, and the median raphe behind the anus.

The inner margins of the muscular bellies surround the rectum and anal canal behind and the vagina in front, and the muscles in their contraction exert a strong sphincteric influence on these two canals. In the one case they play an important rôle in the act of defaecation. In the other they brace up the vaginal orifice and canal. The power which the levatores can exert is sometimes very evident when the hand has to be introduced into the vagina during labour. Contraction of the muscle may then be so strong as actually to cause severe pain on the hand and wrist, and the sphincteric grip of the levatores may be so powerful as to imprison the hand till the spasm passes off.

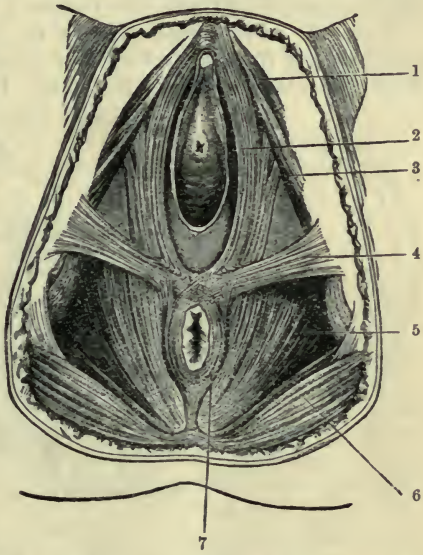


FIG. 16.—Dissection showing the muscles of the vulvar area and the pelvic floor.

1, 3. Ischio-cavernosus.
2. Sphincter vaginae.
4. Transversus perinei.
5. Levator ani.
6. Gluteus maximus.
7. External anal sphincter.

The free edges of the levatores can often be distinctly felt by passing the thumbs into the vagina, when the patient is in the lithotomy position, and hooking them downwards and outwards.

The chief *function* of the muscle is to give the support and resilience necessary for the effective action of the pelvic floor

in closing in the pelvic cavity below. The sphincteric action of the muscles helps in the act of defaecation and in keeping the vaginal canal closed.

Pubic and Sacral Segments of Pelvic Floor.—The pelvic floor has been arbitrarily divided into two segments by Berry Hart—Anterior or Pubic and Posterior or Sacral.

Pubic Segment.—This consists of the part of the pelvic diaphragm in front of and including the anterior vaginal wall. The bladder is imbedded in this part. It is only comparatively

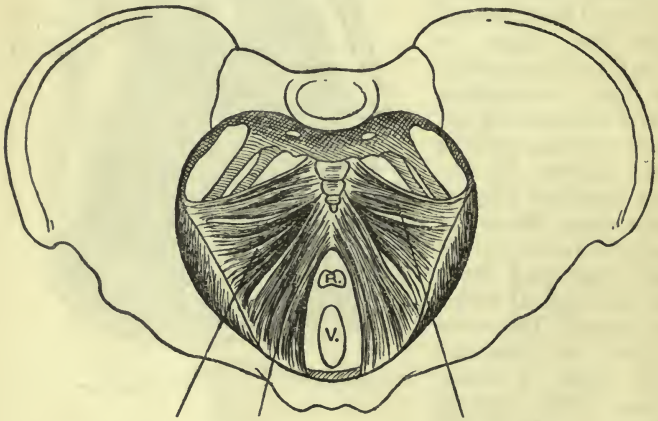


Fig. 17.—Levatores ani and coccygei as seen from above.

loosely attached to the bony pelvis, as is seen during the first stage of labour when it becomes drawn upwards, overriding the pubis in front and the sacral segment behind.

Sacral Segment.—This consists of the part of the diaphragm behind and including the posterior vaginal wall. The rectum and anal canal are imbedded in this segment and, unlike the pubic segment, it is firmly attached to the surrounding bone. During labour it becomes gradually more and more stretched out and pressed down by the advancing head.

The way in which the two segments of the pelvic floor behave during labour has been likened to the two flaps of a folding-door when one flap is pulled inward and the other pushed outward.

CHAPTER III

FALLOPIAN TUBES—OVARIES—PAROVARIUM

THE FALLOPIAN TUBES

The Fallopian tubes extend, one on each side from the side of the fundus uteri, outwards for a distance of about 4 in. They pass directly outwards in the first part of their course, after which they pass downwards and backwards and inwards. In this way the tubes partly encircle the ovaries (Figs. 3, 15). They are placed within the upper edge of the broad ligament, which has the same relation to the tube that a mesentery has to bowel. The broad ligament is thus often called the meso-salpinx. The tube perforates the broad ligament before this reaches the side wall of the pelvis and opens directly into the peritoneal cavity by the *abdominal ostium*. The portion of broad ligament external to the Fallopian tube, between it and the pelvic wall, is called the infundibulo-pelvic ligament.

The tube is divided arbitrarily into four portions: (1) the **interstitial** portion where the tube perforates the uterine wall; (2) the **isthmus,** the narrow region just external to the uterus; (3) the **ampulla,** which is beyond the isthmus (this is the widest region of the tube); (4) the **fimbriated end** (this consists of a series of fimbriae or branches which radiate from the abdominal ostium). The general arrangement suggests that the tube has been split at its outer end into tapering strips of tissue to expand the opening to the widest possible extent, in order to capture the ova as they are shed from the ovary. This in effect is the object of this remarkable appearance. One of the fimbriae is longer than the others and arches round to obtain attachment to the outer pole of the ovary.

This is called the *ovarian fimbria*, and by some is supposed to be specially concerned in guiding the ova into the tube.

Muscular Wall.—This consists of an outer longitudinal and an inner circular layer.

Mucous Membrane.—This lines the entire length of the tube,

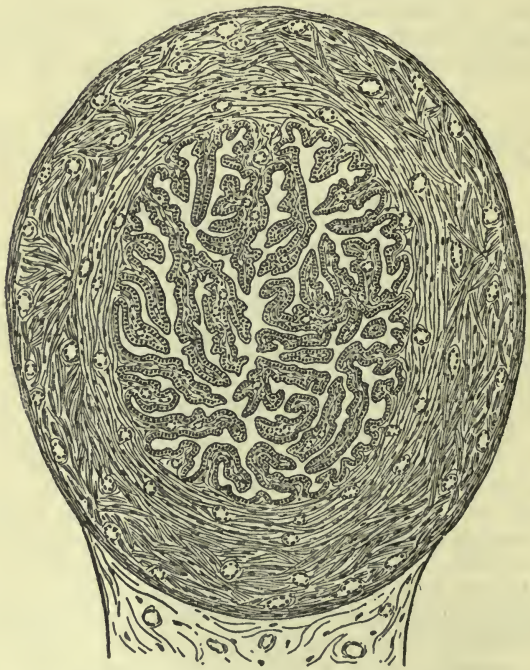


Fig. 19.—Transverse section of Fallopian tube in its ampullary portion.

and consists of a layer of columnar ciliated epithelium resting on a stroma of soft connective tissue similar to that present in the mucosa of the corpus uteri. The mucosa rests directly on the muscular wall. In the interstitial and isthmal portions the mucous lining is raised into four or five simple longitudinal ridges, giving a stellate appearance to the lumen when the tube is cut transversely. In the ampulla each fold becomes

luxuriant, breaking into an arborescent structure, so that the appearance of simple ridging is replaced by a rich branching lattice-work formed by the fine strands of mucosa (Fig. 19). The fimbriae which encircle the ostium correspond to these mucosa folds of the ampulla which have escaped from the tube and project as branching processes into the abdominal cavity beyond the muscular wall.

The cilia of the tubal epithelium are supposed to maintain a stream of fluid flowing from peritoneal cavity to uterus. This stream determines the entrance of the ruptured ovum into the tubal orifice (perhaps guided by the ovarian fimbria) and carries it onwards to the uterus. It is likely that the peristaltic contraction of the muscular wall of the tube shares in the transmission of the ovum. Fertilisation of ova is believed to occur ordinarily in the tube.

Blood-Vessels.—The tube is supplied by twigs from the ovarian vessels (Fig. 14).

Lymphatics.—These accompany the lymphatics running from the upper part of the corpus uteri.

Nerves.—These are derived from the renal and aortic plexuses. Cerebrospinal nerve twigs also reach it from the eleventh and twelfth dorsal and first lumbar nerves.

THE OVARIES

The ovaries are two almond-shaped bodies measuring about $1\frac{1}{2}$ in. by $\frac{3}{4}$ in. by $\frac{1}{2}$ in. They lie in the true pelvis close up against the pelvic wall and just below the brim. At the *hilum* the ovary is slung from the back wall of the broad ligament by a short peritoneal fold—the *mesovarium*. It is held in place by the broad ligament and by the extension of this to the side wall of the pelvis, the infundibulo-pelvic ligament or the *suspensory ligament of the ovary*. The ovary is tethered in place also by the *ovarian ligament*. This is a cord of fibrous and unstriped muscle tissue which extends from the side of the uterus just below and behind the uterine end of the tube to the uterine pole of the ovary. Throughout its course it lies in the broad ligament and reaches the ovary along the mesovarium (Figs. 3, 4, 13).

The **position** of the ovaries in the pelvis varies with the

position of the broad ligament, and this in turn varies with the position of the uterus. On the average the ovary lies with its long axis vertical. The lower end is attached to the uterus by the ovarian ligament. The upper end is attached to the ovarian fimbria of the tube. Ordinarily the tube nearly encircles the ovary.

In the infant and up to puberty the surface of the ovary is smooth and glistening. Thereafter, with the onset of menstruation, its surface becomes puckered by the repeated rupture of follicles, and this puckering increases with age. After the normal cessation of menstruation, with the termination of the reproductive life of the woman, the ovaries shrink until in an old woman they are small insignificant organs.

The surface of the ovary is whitish or bluish white. At the point of attachment to the mesovarium—the *hilum*—the puckered white surface stops abruptly where the peritoneum commences, the demarcation showing as a white line.

The ovary is divided into two regions, which, though not separated by any definite line of demarcation, are distinguished by their structure and function :

(1) The Medulla. (2) The Cortex.

The Medulla

This subtends the hilum and to it the vessels pass from the broad ligament to be distributed to the ovary. It consists of connective tissue with some unstriped muscle continuous with the same structures of the broad ligament. In addition, the nerves and lymphatics of the ovary enter here. Scattered about in the connective tissue matrix blind tubules lined by columnar epithelium may be seen on careful microscopic examination. These constitute the *rete ovarii* and originate from the germ epithelium, the precursor of all the epithelial elements of the ovary.

The Cortex

This is the important part of the ovary, as in it lie the elements upon which the specialised functions of the ovary depend. The cortex forms the main mass of the ovary. It occupies all the surface area and surmounts and partly surrounds the medulla.

It contains (*a*) connective tissue and (*b*) epithelial elements.

The Connective Tissue or Stroma of the cortex consists of spindle cells closely packed together to form a homogeneous, dense matrix, which supports the vessels and nerves and the Graafian follicles. At the surface of the ovary just under the epithelial covering the stroma is condensed to form the *tunica albuginea*.

The Epithelial Elements of the cortex consist of: (*a*) The *germinal epithelium*, a continuous layer of cuboidal cells which covers the surface of the ovary. (*b*) The *interstitial gland of the ovary*. In the human subject this consists of patches of cells larger and more epithelium-like than the stroma cells. These patches are scattered through the cortex and they are sometimes difficult to see. By some they are supposed to have an important function, which will be referred to when the functions of the ovary are being discussed. In some of the lower animals, *e.g.* the rabbit and rat, this part of the ovary is more prominent than it is in the human. (*c*) The *Graafian follicles*. These are bound up with the process of ovulation, each follicle enclosing an ovum and superintending it throughout its career in the ovary and, as we shall see, even after it has matured and left the ovary.

In each infant ovary there are said to be about 100,000 ova. At puberty there are about 30,000.

The Graafian follicle is present in four stages:

1. The primordial follicle.
2. The maturing follicle.
3. The mature follicle.
4. The corpus luteum.

Primordial Follicle.—This is the condition of all the follicles at birth, and throughout life a large number never advance beyond this, the original and the resting phase. The ovum or egg-cell occupies the centre of the follicle, being surrounded by a layer of flattened cells that differ in no apparent degree from the surrounding stroma cells (Fig. 20).

The *ovum* at this stage has no special features. The large cell body is clear with a fine network showing under high magnification. There is no cell-membrane. The nucleus contains an eccentric nucleolus.

The primordial follicles are situated for the most part in the superficial layer of the cortex.

Maturing Follicle.—The process of maturation of a follicle does not occur in its complete form till after puberty. But even before puberty the preliminary stages of this process are seen in many follicles. The ovum becomes slightly enlarged, but the main change occurs in the adjacent stroma cells of the ovary. From being flattened cells these enlarge to form a

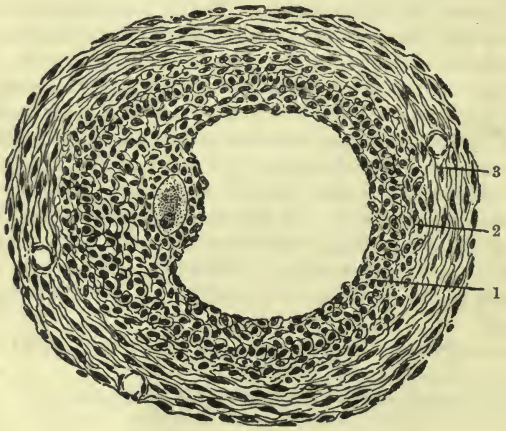


FIG. 21.—Maturing follicle.

1. Membrana granulosa. 2. Tunica interna. 3. Tunica externa.

layer of cubical epithelial or epithelium-like cells arranged in the form of a hollow sphere round the ovum. At first arranged in a single layer, they proliferate and become several layers deep. An accumulation of fluid gathers in one part of the solid layer of cells. This is called the *liquor folliculi*, and as it grows it displaces the ovum from its central position (Fig. 20).

Follicles which show these maturation changes sink into the deeper layers of the stroma and come nearer to the medulla of the ovary. If they do not go on to the later stages of maturation they remain in the deeper layers of the ovary where they are strangled and degenerate, becoming converted into whitish

areas—*corpora fibrosa or albicantia.* Follicles which die prematurely are called *atretic follicles.*

Mature Follicle.—Complete maturation of follicles only occurs after puberty.

The following elements constitute the mature follicle and each requires individual study :

The Epithelial Covering—the Membrana Granulosa.
The Liquor Folliculi.
The Ovum.
The Connective Tissue Covering.

A follicle which is set aside for complete ripening undergoes, in its earlier stages, changes similar to those described in the preceding paragraph. The ovum enlarges, the epithelial cells develop as a complete layer round the ovum—the *membrana granulosa*—and, in this layer, at one part, the liquor folliculi forms. Beginning in the same way, the changes develop to a greater extent. The membrana granulosa cells proliferate actively and the liquor folliculi goes on increasing. As the result of these combined changes the follicle increases steadily in size. The accumulating liquor presses the cell-mass containing the ovum up against the follicular wall, so that it assumes the form of a disc and is therefore called the *discus proligerus* (Fig. 20).

In the course of time the follicle, expanding now almost entirely by virtue of the increasing liquor, shows a thinning out of the layer of epithelial cells.

Pari passu with the changes just described the ovum becomes larger, increasing to two or three times its original size. A fully grown ovum in the follicle is about $\frac{1}{125}$ in. in diameter. The central part of the cell protoplasm is granular and contains an eccentric nucleus with nucleolus. There is now a cell-membrane. Outside this is the clear *perivitelline space,* surrounded by another clear space, the *zona pellucida,* which is traversed radially by fine fibrils. The granulosa cells immediately abutting on this space are laid against one another in a radial fashion and form the *zona radiata.* The ovum is not ripe for fertilisation till the development and casting off of the polar bodies is carried out. These finer points of histology have an interest only for the microscopist and embryologist.

Whilst these changes are going on within the follicle, important developments are occurring in the connective tissue of the ovary which encircles the follicle. This becomes separated into two layers—tunica interna and tunica externa. The *tunica externa* becomes vascular but otherwise is little different from the unaltered stroma. The *tunica interna* shows marked changes. In the first place it becomes greatly congested, due to the distension of old vessels and the formation of new vessels. In the second place the cells in the neighbourhood of the granulosa cells enlarge and increase in numbers until eventually they form a layer of large epithelium-like cells surrounding the follicle on all sides. With special hardening and staining methods they are seen to contain a pigment. This is lutein, and at a later stage in development it gives to this layer of cells a yellow colour. The cells containing it are called the *lutein cells*, and the layer of cells becomes the corpus luteum.

As the follicle expands it rises from the depths of the ovary to the surface and forms a bulging swelling with congested surroundings. On section the vesicle formed by the mature follicle may be as large as $\frac{1}{3}$ in. in diameter. By pressure the tissue covering the summit becomes thinned and eventually gives way at the *stigma*. Through this the ovum, surrounded by a few granulosa cells and accompanied by the liquor, escapes into the peritoneal cavity. Thence it passes into the Fallopian tube and passes towards the uterus. Fertilisation, when it occurs, probably takes place in the Fallopian tube.

Corpus Luteum.—The stigma or point of dehiscence becomes rapidly sealed with blood-clot. The follicle cavity becomes filled with blood poured from the vessels. The appearance of the follicle immediately after ovulation is thus a small blood-cyst. Even at this time, and certainly within a few days, if the cyst is cut across, the wall immediately adjacent to the cavity is seen to be lined by a thin bright yellow layer of tissue. The follicle has now become the corpus luteum.

The cells which form the corpus luteum, as we have seen in a preceding paragraph, develop in the theca interna. The yellow cells are visible in the theca even before complete maturation. After the escape of the ovum the cells of the theca interna proliferate so rapidly that the fine yellow stratum becomes transformed into a thick layer possessing

a bright yellow colour and thrown into convolutions by the speed of growth (Fig. 22). There is always in the fresh corpus a central cavity filled with coagulated blood, and the colour contrasts thus produced constitute a very characteristic and striking picture. Under the microscope the luteal layer is seen to consist of large, closely packed cells. Special methods of preparation are required to show up the pigment in the cells.

The ovarian stroma in the neighbourhood of the corpus luteum is richly vascular and this vascularity extends into the centre of the luteal masses of cells, which thus lie close up against the capillary twigs. This arrangement resembles that found in the various ductless glands of the body. It is obviously in them provided for the purpose of allowing the secretion of the cells to pass directly into the blood-stream. The corpus luteum in this respect resembles such glands as the suprarenal and the islets of Langerhans in the pancreas, and it is probable that it, like them, is concerned with the elaboration of some internal secretion. This point will be again brought up for consideration (see p. 37).

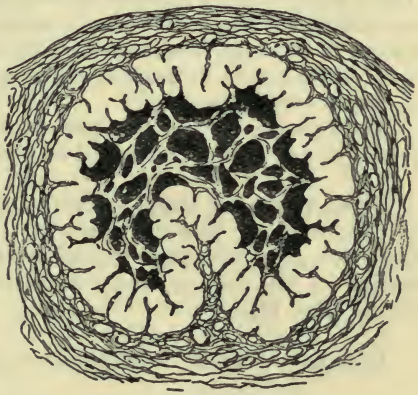


FIG. 22.—Corpus luteum.

The fully formed corpus luteum shows on the surface of the ovary as a smooth rounded bulging set in an area of congestion. Its average size is about ½ in. to ¾ in. One of its features is that it can be shelled out of the ovary with great ease.

Under ordinary circumstances—the **corpus luteum of menstruation**—the body shrinks rapidly as the result of a hyaline degeneration. The hyaline matter is invaded by connective tissue and is split up into smaller whitish areas—**corpora albicantia or corpora fibrosa**—similar to the structures left behind by an atretic follicle. When conception occurs the

corpus luteum continues to develop for some months, reaching its largest size after about three months—**corpus luteum of pregnancy.** The natural deduction is that it is concerned in some way with the physiology of pregnancy, and this deduction, it will be seen, is supported by some experimental findings (see p. 40).

Cyclic Nature of the Ovarian Changes.—It is believed that the changes described in the preceding paragraphs occur, not in a haphazard manner, but in a definite periodic fashion. There may be many follicles developing at one time but they are in different stages of the same process, and this process is so timed, in response to some law of which we are ignorant, that one follicle comes to fruition and ovulates every month at a definitely recurring period.

The relation between the periodicity of ovulation and the periodicity of menstruation will be referred to on p. 37.

Blood-Vessels of Ovary.—These consist of twigs from the ovarian artery. The right ovarian vein enters the inferior vena cava, the left enters the left renal vein. The ascending branch of the uterine artery anastomoses with the ovarian artery (Fig. 14).

Lymphatic Vessels.—These pass to the lumbar glands.

Nerve-Supply. — This comes from the renal and aortic plexuses.

PAROVARIUM

The parovarian body (Fig. 4) is a vestigial remnant in the female derived from the Wolffian Body and Duct, and corresponding developmentally to the epididymis and vas deferens of the testis in the male. It lies in the broad ligament and is best seen by putting the portion of the broad ligament between the tube and ovary on the stretch and examining it against the light. The parovarium consists of ten or twelve tubules which are placed side by side and run vertically between the layers of the broad ligament, their lower ends converging to the hilum of the ovary, where they disappear. Their upper ends

are united by the *Duct of Gärtner*, which, at its outer end, often breaks up into a series of tubules—Kobelt's Tubules. On the inner side it continues along the side of the uterus for a varying distance, where it disappears. The lower end of this duct occasionally persists as an interrupted tube imbedded in the antero-lateral wall of the vagina, and may form cystic swellings bulging into the vagina.

CHAPTER IV

MENSTRUATION

The chief physiological fulfilment of the genital organs—pregnancy—is discussed in obstetrical books and need not be considered here. So intimate a bearing, however, has pregnancy and labour, and especially complicated labour, on the whole subject of disease of the reproductive organs, that an enlightened understanding of gynecology is impossible without a knowledge of obstetrics.

Puberty.—This commences with the onset of menstruation, when the characters of sex become firmly established. But even before this the lines of sex are being laid. From the beginning the girl child exhibits traits that betray her sex. She longs for dolls, and in other ways, such as the tenderness of her attentions, she exhibits early glimmerings of maternity. The boy child early shows a partiality for more vigorous likings, he prefers to climb and romp and to possess or construct toy trains, etc. But while the sex differences predispose to these differing characters, the environment and training exaggerate them, and it is often a matter of difficulty to know how far in any case environment and how far essential instinct has operated. The overriding influence of environment is well seen in the case of the girl reared with brothers, when the female attributes may be considerably checked.

With puberty the lines of distinction between the sexes become emphasised. There are *mental* characters. The child is suddenly conscious of her sex. She is shy and reserved, especially in the presence of boys. Her mind develops with one bound from that of the young irresponsible girl into that of the serious woman. There are also *physical* changes. The whole body becomes rounder and plumper, and the breasts

enlarge. The whole stature may increase and the growth exhibited at this time may be marked and sudden.

Changes in the genital organs also occur. The mons veneris and labia majora become larger from an increased deposit of fat. The outer surfaces of the labia and the mons become covered with hair. With the increase in the labia majora the whole character of the vulva changes. The labia minora in the young child are relatively large, but with puberty they are soon concealed by the growth of the larger labia.

The *internal genital organs* develop. The uterus increases in size and becomes stirred by the cyclic stimulus that initiates and maintains the function of menstruation. The ovaries become larger, and in the cortex the activities of ovulation and probably internal secretion commence, activities which persist throughout reproductive life and are accompanied by the flux of change which has been described in a previous chapter. Amongst these changes the most obvious and the most important consist of the maturation of the follicles and the formation of corpora lutea.

Simultaneously with the changes in the genital glands there occur changes in the *endocrinous glands* in other regions. Recent investigation has shown the intimate relationships that exist between the ovaries and the ductless glands. The details of these relationships have not been worked out. This fascinating subject is still in its infancy. Only the confines have been explored, but sufficient has been learnt to show that the rôle played by the ductless glands is one of fundamental importance in the physiological economy of the body. Each gland has a specific function, but it is dependent on the activity of some or all of the other glands. One gland activates or inhibits other glands. The removal of one gland leads to the diminution or to the enlargement of others.

It is believed on grounds that will be analysed in a subsequent paragraph that the ovary is an endocrinous gland and its activation at puberty is correlated with changes in other glands such as the thymus, the thyroid, the pituitary, and the suprarenal.

Age of Onset.—In this country the **menarché** or the beginning of menstruation occurs on the average at the age of 14 or 15 years. The actual time of incidence varies within wide limits, depending on individual or racial factors. Menstrua-

tion may occur abnormally early. A case has been reported in an infant between two and three years, and this child had a full-term pregnancy at the age of nine. Menstruation may not commence till very late, 18, 19, or 20, or even older. Racial are more important than climatic factors. In warm climates the function may, as in India, commence in the natives early, or, as in some negresses, it may be late. In cold climates it may occur late or, as in the Esquimaux, early. The menarché may start with a menstrual flow which is established and regular from the beginning. Often, however, the early periods are irregular in their cycle and in their quantity and it requires some months or years for the periodicity to become adjusted.

The first menstrual period is preceded usually by definite molimina in the shape of malaise, headache, and pain in the back, and by these the mother is made aware of the imminence of her daughter's function. The wise mother has beforehand warned the girl of the nature of this function and has, in a way which a mother alone can do, taken her daughter into her confidence regarding matters of general sexual hygiene.

Menstrual Type.—This means the duration of the menstrual cycle and is best measured from the onset of one period to the onset of the next. In the majority of women this corresponds to 28 days, though it may be as low as 21 days and as high as 35 days. The average type is 28 days, and anything from 21 to 35 days may be taken as normal. Any variation from the type in an individual outside a matter of a day or two is usually evidence of disease, except in cases of pregnancy, when the function is suspended. So accurately recurring is the periodicity in some women that even a day missed is to them a certain sign of pregnancy.

Some women are liable to irregularity of type without more to account for it than nervous upset, due to shock. In this class will fall that cessation of menstruation which was commonly seen in women due to the shocks of mind incidental to the past war. The announcement of the death of a close relative has often led to a sudden and prolonged suspension of the function. So change of environment may upset the cycle, as in country girls who come to town for service, and so on.

Duration or Habit.—Menstrual habit is the term applied to the duration of the blood loss. The average is 5 days, but it varies within normal limits from 1 day to 8 days. The

duration is no guide to the amount lost, for this varies in different individuals. In the same individual, however, the duration remains the same in health. Just as the environment may affect the type, so it may affect the habit of menstruation. Even normal sexual intercourse when first established after marriage may increase the flow. So women who migrate to warmer climes may suffer an excess. This was especially seen during the past war, when a large proportion of the nurses who left home for hot countries suffered.

Menopause.—This is the term applied to the cessation of menstruation at the end of reproductive life. On the average it occurs between the ages of 45 and 50, though in not a few cases it occurs before 45 or after 50. It rarely occurs before 40 unless by disease destroying the ovarian substance, or after removal of the ovaries by operation. Premature menopause may, however, occur as early as in the twenties without any obvious cause.

The menopause may become established without any untoward symptoms. On the other hand, unpleasant manifestations may develop. These symptoms are chiefly in the shape of vascular phenomena, of which the commonest are sudden flushings of the face and body, and of mental phenomena, *e.g.* irritability and insomnia. Insanity may supervene.

With the suspension of menstruation the sexual inclination of a woman abates in intensity as a rule, though in a vigorous woman the feelings of sexual life may outlast the menopause by many years.

Body Changes in Menstruation.—The changes induced by menstruation have been specially studied in the mucous membrane of the uterine body from which the blood discharge is derived. But there are other and marked changes in the uterus and other generative organs. During menstruation there is a congestion of all the pelvic viscera, a fact which explains the tendency to pelvic pain or discomfort which exists at that time. It also accounts for the exacerbation of pain which occurs in pelvic disease. This congestion especially involves the uterus, which becomes swollen and hyperaemic, especially in the corpus. The cervix becomes softened and patent, and the vagina and vulva likewise become soft and more patulous.

In addition, widespread evidences of the menstrual function

are seen in the swelling and tenderness of the breasts which often occur, and in the malaise and headache that often precede and accompany menstruation.

Histology of Menstruation

The menstrual cycle is usually divided into four periods lasting on the average as follows :

1. Resting	4 days.
2. Premenstrual	10 ,,
3. Menstrual	5 ,,
4. Postmenstrual	9 ,,

The changes in the endometrium are as follows :

1. **Resting Stage.**—This corresponds to the condition midway between two periods, when the endometrium presents the appearances described on p. 10. The mucosa is then about 2 mm. thick.

2. **Premenstrual Stage.**—In this stage the mucosa becomes turgid and thickened, and these changes gradually increase in degree up to the actual onset of bleeding. At the end it may be 6–8 mm. thick. The thickening is due to two factors. (*a*) There is *an increase in the stroma* due to a proliferation of the connective tissue cells, to an expansion of the vessels and, especially in the superficial layers, to a wholesale escape of blood and fluid from the vessels into the stroma. The stroma consists of a special tissue characterised by its great softness. Throughout its entire extent it is as soft and labile as a jelly. This structural feature enables the rapid flushing of any part of the surface with blood and fluid during menstruation and in the early stages of pregnancy. Investigations have made it probable that these changes are induced, in the one case, by the biochemical material originating from the ovary and, in the other case, by a somewhat similar material produced by the cells of the young ovum after it has reached the uterus.

The haemorrhagic infiltration of the surface layers is most marked immediately before menstruation, when the superficial epithelium may be floated up in places to form little blisters distended by blood (Fig. 15). (*b*) There is *an increase in the glands.* The gland cells become actively secreting and they proliferate rapidly, so rapidly that the glands become

lengthened more quickly than the stroma thickens. The gland tubules thus become bent and corkscrew-like.

3. **Menstrual Stage.**—The blood now leaks from the surface of the mucosa, partly as the result of surface abrasions, where small parts of epithelium and stroma have been floated off, but chiefly by a diapedesis of the blood cells and fluid through the epithelial covering (Fig. 15). It is probable that in healthy menstruation there is little or no destruction of tissue. We know that the extensive removal of the upper layers of mucosa, described by the old writers, was really an artefact occurring during the post-mortem changes, which rapidly disintegrate such a soft tissue as the endometrium.

As Blair Bell has shown, in this stage there occurs a secretion or excretion of calcium from the mucosa. With appropriate methods leucocytes can be seen migrating into the uterine cavity charged with calcium particles.

4. **Postmenstrual Stage.**—The mucosa has now sunk down more to its ordinary thickness. The stroma elements retrogress, any blood not secreted is split up and absorbed, and the vessels and glands shrink.

Characters of Menstrual Fluid.—When fully established the fluid is bright red, though sometimes it is more brownish in colour. At the beginning and the end of the period the flow is pale. Normally menstrual blood does not clot. In diseased conditions, however, and especially where there is an excessive flow, it may clot in the uterus. The normal failure to coagulate is said to be due to the absence of fibrin ferment. The menstrual discharge itself consists of blood mixed with mucus and epithelial cells shed from the endometrium and from the cervical and vaginal mucosa. It possesses a characteristic heavy odour.

Causation of Menstruation—Its Relation to Ovulation

Ample proof is available to show that the ovary is the origin of the periodic changes which the uterus undergoes during the menstrual cycle. Menstruation commences at the time when the ovaries first undergo the activities of maturation and ovulation. Only in very rare cases does ovulation take

place before the onset of menstruation, as is seen in the occasional occurrence of pregnancy before the menstrual function commences. More conclusive proof of the dependence of the function on the ovaries is seen in its complete suspension after operative removal of the two ovaries. The rare instances, in which menstruation persists despite apparent complete removal, are easily explained by the fact that even a small piece of ovarian tissue inadvertently left behind may rapidly hypertrophy and carry on the ovarian function.

The effects of transplantation of strips of ovarian tissue into the abdominal wall, or elsewhere, after a bilateral removal of the ovaries provide strong supporting evidence. In some such cases menstruation may be carried on, and that the transplanted strips continue to function is shown by the periodic swelling and tenderness which they exhibit every month in their adventitious site.

The exact nature of the ovarian stimulus that induces menstruation is still obscure. It is believed with good reason that it is a biochemical substance, which is produced in some part of the ovarian tissue, and which is conveyed throughout the body *via* the blood-stream. The uterine mucous membrane is specially sensitised to its action, and, normally, it is the only tissue in the body which reacts by producing the full menstrual function, ending in a discharge of blood. But, even in health, the chemical substance which is poured periodically into the blood from the ovaries may induce widespread effects in the body. Some of these have the appearance of a physiological reaction, such as swelling and tenderness of the breasts, others may suggest a pathological condition, such as malaise, headache, mental irritability, etc., though they occur in otherwise healthy women. It is thus probable that far-spread metabolic changes occur in the body in association with menstruation. How far the high calcium content of the blood, which precedes menstruation and subsides with the establishment of the function, is to be considered as causally related to, or as only an incident in the whole metabolic process of menstruation, it is so far impossible to tell.

All that is clear is that from some region of the ovary a chemical material is elaborated in increasing waves of periodicity every month, the rising slope of the wave corresponding to the premenstrual phase, the summit to menstruation

itself, and the down slope to the postmenstrual phase. The question as to which region of the ovary is concerned in the production of the menstrual material is still incompletely answered.

In this connection a difficulty arises at once. Before the exact nature and origin of the ovarian material could be even approximately determined, it would be necessary to know the exact relationship existing between the uterine cycle of changes and the ovarian cycle. Does menstruation coincide with ovulation, or does it precede it, or does it follow it ? There are thus three simple possibilities. If menstruation and ovulation coincide, the inference would be that ovulation causes or promotes menstruation. If ovulation precedes menstruation by any appreciable time, the corpus luteum, which by this time would be developed in the ruptured follicle, would be legitimately looked to as the source. Whereas, if ovulation succeeded the menstrual flow, the inference would be that neither ovulation nor the corpus luteum would be the immediate source of menstruation.

The subject is still obscure, and it is impossible to pronounce definitely in favour of one or the other of the above theories. The **Ovulation Theory** still has some adherents. On the whole, however, the **Luteal Theory** is the present fashion, largely due to the work of Fraenkel. This observer maintains that a fresh corpus luteum may be found in one ovary, if looked for, in any operation which offers the opportunity of examining the pelvic structures during menstruation. He moreover believes similarly that, some days before menstruation, a freshly ruptured follicle may be found, and if the ovulating ovary is removed for disease at this time the subsequent menstrual period is suspended.

It may be asked, " Can no helpful information be obtained from the lower animals ? " Only few animals have anything corresponding completely to the menstrual function of man. In some monkeys the process is identical or nearly identical. Throughout the mammalia a periodic flushing of the genitals occurs, ending in an escape of mucus. This is called the *pro-oestrum*. It immediately precedes the period of *oestrus* or heat, during which alone the female will receive the male. It is commonly believed, with some reason, that pro-oestrum corresponds morphologically to menstruation. Now, in some of the

lower animals, it has been shown that ovulation occurs only during or after coitus, that is, during the period of oestrus. In such cases it is obvious that neither the ovular nor the luteal theory accounts for the pro-oestrum. In this connection, also, it is suggestive to find that in woman there is a definite period of enhanced sexual feeling after menstruation. This would correspond to the period of animal oestrus, and this analogy, taken in conjunction with the above-noted facts, suggests that there may be some deep-seated correspondence between pro-oestrum and menstruation, a correspondence which, in either case, is independent of ovulation or the corpus luteum.

Considerations such as those just advanced have led many observers to look elsewhere for the source of the menstrual stimulus. By these it has been traced to the so-called **interstitial gland of the ovary,** which has been described on a preceding page, and which, in the human ovary, consists of inconspicuous islets of epithelium scattered throughout the ovarian substance.

CHAPTER V

FUNCTIONS OF THE OVARY IN THE ENDOCRINE SYSTEM

From what has been said on previous pages it has become apparent that the ovary has two chief functions to perform :

(1) Ovulation. (2) Internal secretion.

Too great a tendency is apparent in text-books to isolate the two functions from one another, whereas in all probability there is an intimate interrelation. For the function of internal secretion is, after all, a provision whereby the economy of the woman may be safeguarded and maintained at a level necessary for the proper carrying out of the great purpose for which ovulation stands, namely reproduction. The changes underlying ovulation have been described on preceding pages, and it has been shown how, after ovulating, the Graafian follicle proceeds to the formation of a corpus luteum.

The internal secretory activity of the ovary is somewhat complex. On it depend the following functions :

(*a*) Menstruation.

(*b*) Development and maintenance of the generative organs.

(*c*) Maintenance of the general health and stability of the whole organism.

(*d*) Maintenance of the normal endocrine system.

How far these functions are mutually independent or how far they are manifestations of one and the same influence it is difficult to say.

(*a*) **Menstruation.**—This question has already been discussed. Neither the Ovulation nor the Luteal Theory explains it. It may be due to an internal secretion derived from the interstitial gland of the ovary.

(*b*) **Development and Maintenance of the Generative Organs.**

—The ovary is necessary for the complete development of the sex characters and for the development of the internal genitalia. Castration in the young animal inhibits the growth of the uterus and tubes, which remain shrunken and primitive. The same suspended development of the internal organs occurs in any condition where bilateral removal of the ovaries is required in a young child.

If the ovaries are removed after adult development is reached, the internal organs shrink and atrophy. This change has been repeatedly demonstrated in women after bilateral removal of the ovaries for disease, and it has been worked out in detail in the lower animals. The same changes occur after the physiological cessation of the ovarian function at the menopause.

During the early stages of pregnancy it is probable that the corpus luteum has a specific function to perform in connection with the development of the ovum. It has already been pointed out that during pregnancy the corpus luteum undergoes a very special development. The "corpus luteum of menstruation" rapidly shrinks, whereas the "corpus luteum of pregnancy" continues to exhibit progressive development for a number of months. Moreover, removal of the ovary containing the corpus luteum or of the corpus luteum itself, if carried out during the early weeks of pregnancy, is followed by abortion. This result does not attend removal of the corpus luteum in later months. It seems, then, that the corpus presides over the destiny of its ovum after this has become embedded in the uterus, just as the predecessor of the corpus luteum, the Graafian follicle, presided over the ovum during its life in the ovary.

(*c*) **Maintenance of General Health.**—Removal of the ovaries by operation or disease and the natural cessation of the ovarian function at the menopause are apt to be associated with widespread effects in the body. These effects may be slight or severe. The chief symptoms consist of vascular phenomena, such as flushings, and mental signs, such as irritability and nervousness. In some cases insanity may supervene. The symptoms are apt to be more pronounced after sudden removal of the ovaries by operation than after the slower suspension of the function which is induced by disease or the normal menopause. They are more evident in the case of younger women,

where they may be fulminant in their intensity. This makes the conservation of ovarian tissue, even though it be only a small amount, a very important consideration in operating on women who have not reached the menopause. Successful transplantation of ovarian tissue may prevent the occurrence of distressing symptoms after ovarian removal.

These facts all indicate that the ovaries are concerned with the production of some secretion that is required for the normal upkeep of the body during the years of reproductive activity.

It is not yet determined from which part of the ovary this secretion arises. It may be the same as the secretion referred to in the two preceding paragraphs. It is probably intimately correlated with the secretions of the other endocrine glands.

(*d*) **Maintenance of the Normal Endocrine System.**—Just as the presence of the internal secretion of the other endocrine glands is necessary for the healthy internal secretory function of the ovary, so, conversely, the other glands depend on the internal secretory activity of the ovary for their normal upkeep and functioning. If the other glands are removed, or their function suffers by disease, the change in the equilibrium affects the ovary, and, *vice versa*, removal or disease of the ovary has its counterpart in a corresponding involvement of the other glands.

So intimate is the interlocking of function that prevails throughout the endocrine system that a given influence is due often not so much to the action of one gland but to the combined action of several glands. Even the maintenance of the generative organs themselves is not wholly due to the ovary, but in this there is a complex correlation of secretory activity.

This subject requires to be still further elucidated by experiment and observation before any comprehensive statement can be made.

Thyroid.—Removal of the ovaries in the lower animals results in an increase in the secretion of colloid in the thyroid. In women Graves' disease may follow bilateral oöphorectomy. Conversely, diminished thyroid activity in myxoedema results in cessation of menstruation, which reappears with the administration of thyroid extract.

Pituitary.—Removal of the ovaries in animals is associated with changes in the pituitary suggesting an increased function. The converse results of the removal of the pituitary on the

genital organs have been more completely studied. Where a young animal survives the operation of extirpation of the pituitary, an infantile condition with a tendency to obesity is established. The uterus and ovaries remain undeveloped.

Thymus.—The thymus shrinks at puberty at a time when the ovaries commence to functionate. Conversely, removal of the ovaries in the young animal induces a persistence of the thymus.

SECTION II
EXAMINATION OF THE PATIENT

CHAPTER VI

HISTORY—PHYSICAL EXAMINATION

THE investigation of a patient suspected of gynecological disease falls under the headings of (*a*) history and (*b*) physical examination.

HISTORY

A useful routine is to note first the following:

Name	Address
Age	
Married or single or widow	
Children	Number
	Age of last-born
Miscarriages	Number
	Date of last

Noteworthy facts in regard to the pregnancies, labours, and puerperia, *e.g.* pain, instrumental delivery, fever, ages of the miscarriages, etc.

Menstrual History.

Age of Commencement.

Type, *i.e.* number of days between the onset of two succeeding periods.

Duration.

If regular or irregular.

If amenorrhoea, how long ?
If menorrhagia, and metrorrhagia ?
If dysmenorrhoea, premenstrual or menstrual ?
Date of last menstrual period.

History of Present Illness.—The nature of the condition complained of, its duration, its relation to a preceding infection, to menstruation, to a preceding labour or miscarriage, are all noted, as also other relevant facts.

Previous Illnesses.—Here the history of any infection, gonorrhoeal or puerperal, will be noted, as also any condition suggesting syphilis, *e.g.* repeated miscarriages or premature labours, or tuberculosis.

Physical Examination

Wherever possible a gynecological examination should only be made in the presence of a nurse or some female relative of the patient.

General Appearance.—Under this heading the signs of anaemia or wasting and the presence of scars in the neck will be noted, and also any other features of possible value.

Mammary Examination.—The condition of the mammae, especially in regard to the changes denoting pregnancy, is noted—fullness, distension of the superficial veins, pigmentation of the areolae, and the presence of colostrum are all charted.

Abdominal Examination.—For this the patient lies on her back with her clothes freely loosened to expose the entire surface of the abdomen. If in bed the bedclothes are folded back to the level of the pubis and the night-gown is doubled back to the level of the xiphisternum.

The *exact sites of any pain* or aching which the patient feels at the moment of examination in the abdomen, back, legs, etc., or which she complains of feeling at other times, are carefully charted.

Inspection of the abdomen is carried out in a good light and the character of the movements noted, as to whether they are free or restricted. In the latter case the area of limited movement is recorded. Any *swelling*, with its shape and site, is noted. The presence and situation of *pigmentation*, *distended veins*, and *striae gravidarum* are charted. In the latter case, are

the striae pale, glistening, and old, or are they red, purple, and recent? It may be important to note whether the *umbilicus* is pouting, flush, or retracted.

Palpation of the Abdomen.—To begin with, the presence and sites of *hyperaesthesia* of the skin, as tested by gentle stroking with a sharp point, are noted. By picking up the muscles between the finger and thumb, the existence of *muscular hyperalgesia* is also noted. The warm hand is now laid flat on the surface. In this examination it is necessary to encourage a relaxation of the abdominal muscles as far as possible, and this is aided greatly by attention to such simple matters as warmth of the hands and gentleness of manipulation. The patient is meanwhile requested to breathe quietly and to draw up her legs, and the gynecologist or the nurse, by engaging her in conversation, diverts her attention from the examination. By insufficient attention to such details, an examination may be frustrated. Despite every effort, however, on the part of the examiner, an efficient examination in a nervous patient may only be possible under anaesthesia.

Palpation reveals the presence of *tenderness*, accompanied with which there is almost always *rigidity* of the abdominal muscles over the corresponding area. The position, shape, consistence, and mobility of any *swelling* are recognised. In cystic tumours a *thrill* may be transmitted across the fluid, whilst in *pregnancy*, ballottement and foetal parts and uterine contractions may be felt.

Swelling due to obesity can be recognised by pinching up the folds of the abdominal wall, when the thick pad of underlying fat is felt. The possible presence of a tumour in association with obesity should be remembered.

Percussion is necessary to locate the relation of the bowel to any swelling, and to exclude a flatulently distended bowel being mistaken for a tumour. In ascites, also, the dulness elicited in the flanks, when the patient is on her back, is noted to become replaced by a tympanitic note if the patient is moved on to her side, and the fluid gravitates towards the other side.

Auscultation is of value in the recognition of the foetal heart, beating at the rate of 120 to 140 a minute in the case of pregnancy. A uterine souffle may, in such cases, be noted at the side of the uterus, where the stethoscope presses on the

distended veins, and the blood is heard rushing audibly through the lumen narrowed by the pressure. A uterine souffle, however, is not diagnostic of pregnancy. It is heard also in some cases of fibroids. The funic souffle, which is sometimes heard in pregnancy, is elicited when, by chance, the stethoscope presses on the umbilical cord and nips it against the body of the foetus. The blowing sound heard in such cases has, of course, the rate of the foetal heart.

Inspection of External Genitals.—This should be carried out in every gynecological case.

The positions available for this examination are the left lateral and the dorsal. For the beginner in gynecology the left lateral is better. The dorsal position is the position otherwise most suitable, for the bimanual examination, which follows in most cases, requires the patient to be on her back. The sheet covering the patient is tucked up between the legs so that the vulvar and anal areas are exposed, but with a minimum of exposure otherwise. The examination is then carried out with a good light beating on the vulva. The condition of the anus and perineum, labia majora, and thighs is noted. Ulcers or warts may be present, or there may be an unusual gaping of the vulvar orifice with, in some cases, a protusion of the anterior vaginal wall covering the bladder (cystocele), the posterior vaginal wall and rectum (rectocele), or of the cervix and the uterus covered by the invaginated walls of the vagina (prolapse). Any downward displacement of vaginal walls or uterus is aggravated when the patient is asked to strain.

In ordinary cases the labia majora are apposed and, to expose the vestibule and vaginal orifice, the examiner has to separate the larger labia with his thumb and forefinger of the left hand.

The condition of the labia minora, vestibule, hymen, and clitoris is taken note of. There may be redness and purulent exudate denoting infection, *e.g.* gonorrhoea. There may be ulceration or other abnormal condition. The urethral orifice is examined, and any inflammation and discharge, or prolapse or caruncle, noted.

CHAPTER VII

PHYSICAL EXAMINATION (*continued*)

Vaginal Examination.—This examination should not be carried out in a menstruating woman except for urgent reasons. In a virginal patient it should only be conducted under anaesthesia. In such patients the necessary information can often be obtained by rectal examination.

After the vulva is inspected, the sheet is again drawn over the legs. The examiner now cleanses his hands carefully. The two first fingers of the right hand are the fingers usually employed for the examination. These are lubricated ; for this ordinary soap has the advantage of being easily obtained. In the case of a virgin the forefinger alone is used. The left hand is dried in readiness for the bimanual examination. In some cases the internal examination of the structures on the left side of the pelvis is best carried out by the fingers of the left hand. It is well, therefore, for the examiner to accustom himself to the employment of both hands in carrying out vaginal examinations.

A glove should be used to cover the examining fingers in all cases where infection is suspected, either as the result of the preliminary inspection of the vulva or from the history. This precaution is urgent in the interest of the examiner where there is fear of syphilis.

The *position* in which the patient is placed depends upon circumstances. For those least experienced in gynecological examinations the left lateral posture is the best, with the patient lying well over to the side of the table or the bed, her two legs being drawn up towards the abdomen, the right one more than the left. The left hand is used to separate the labia and the two examining fingers are inserted by sight and with ease.

Under ordinary circumstances the dorsal position is used, for in this way the patient is ready for the subsequent bimanual examination.

If the patient is placed at the end of the table with her legs held up ready for operation or, as is the practice in some hospitals, for examination, the examiner stands between the patient's legs. Otherwise, the right hand is placed under the patient's right thigh. The latter procedure is the one best adapted for use in practice, for the investigation can be conducted without exposure of the patient.

The fingers are inserted into the vagina with one above the other. The two fingers are rotated after introduction through a right angle, for the vaginal lumen lies transversely.

The condition of the *vaginal orifice* in regard to size, tenderness, etc., is noted. The *vaginal walls* are then palpated and any undue laxity (as in cystocele and prolapse), tenderness, or swelling noted. The *vaginal portion* of the cervix is, in a normal case, felt with ease about 2½ in. from the vaginal orifice. Its size, shape, and consistence are noted, whether it is directed downwards or backwards, or has a forward tilt as in retrodeviations of the uterus. In cases of lateral displacement of the uterus, the cervix is tilted to the one side or the other. In prolapse, or in lengthening of the cervix, it is felt at a lower level, whilst in some conditions it is lifted up, and may be reached only when the examining finger is pressed deeply upward. The *external os* is examined as to whether it is small and circular (nulliparous) or large and oval and perhaps split open laterally (parous). In some rare cases a parous os may be small and circular and indistinguishable from a nulliparous condition. Roughening round the external os may denote "erosion," whilst induration and friability bespeak cancer. A polypus may be found projecting into the vagina through the cervical os.

The vaginal fornices are palpated. In the *anterior fornix* the rounded firm uterine body can often be felt. At a lower level a soft rounded swelling indicates a distended bladder. In a normal case, even deep palpation of the *posterior* and *lateral fornices* reveals nothing. A pelvic colon or rectum distended by faecal masses will be felt through the posterior fornix and posterior vaginal wall. The abnormal swellings that may be felt through the posterior fornix are uterus (retrodisplaced or

the seat of a tumour), tube (swollen by inflammation, pregnancy, or tumour), and ovary (inflammation or tumour). Similarly blood or pus in the pouch of Douglas will bulge the posterior fornix, and a tumour growing downwards from kidney or spleen may, in rare instances, be palpated. A swelling in the broad ligament (cellulitis, blood, or tumour) may likewise be felt through the posterior fornix. In many of the above states where, as in swellings derived from the tube, ovary, or broad ligament, the condition is one-sided, the finger placed in the lateral fornix will best recognise the outlines of the swelling.

Bimanual Examination.—The patient lies on her back with the legs drawn up, and relaxation of the abdominal muscles is obtained in the ways already advised.

After the vaginal examination is completed, the vaginal fingers are kept in position. The other hand is placed flat on the abdomen in the midline, and gentle pressure is made downwards and backwards behind the pubis, the internal fingers being pressed upwards and forwards to meet the external hand. Any swelling in the anterior segment of the pelvis is thus felt between the two hands and its nature recognised. Normally only the rounded, firm, mobile uterine body is felt here. A distended bladder or a tumour growth may in abnormal cases be felt. Sometimes the recognition of the uterus is difficult at first, and then it may be better felt if the cervix is pushed upwards and forwards from below (Fig. 23).

So the posterior and lateral segments of the pelvis can be explored in succession and the situation, shape, consistence, tenderness, and mobility of pelvic swellings recognised more accurately than the vaginal investigation alone allowed of.

Rectal Examination.—This is made with the forefinger of the right hand covered with a finger stall or glove. The best position of the patient is the dorsal position with the legs drawn up. The patient is asked to strain down to open the sphincter, and the finger, well lubricated, is pushed gradually into the orifice.

Rectal examination of the female organs gives, in many cases, a considerable amount of information, and it should always be practised in the first instance in virgins before recourse is had to a vaginal examination under anaesthesia. So, in ordinary cases, rectal examination may be a useful adjuvant to the vaginal method.

Through the anterior rectal wall the vaginal portion of the cervix is easily felt and its direction, shape, and consistence noted. Farther upwards and to the sides, any swelling arising from uterus, tubes, and ovaries, or any other condition can be felt.

Bimanual examination can be made with the one hand placed on the abdomen, as in the ordinary examination, and the rectal finger used in lieu of the vaginal fingers.

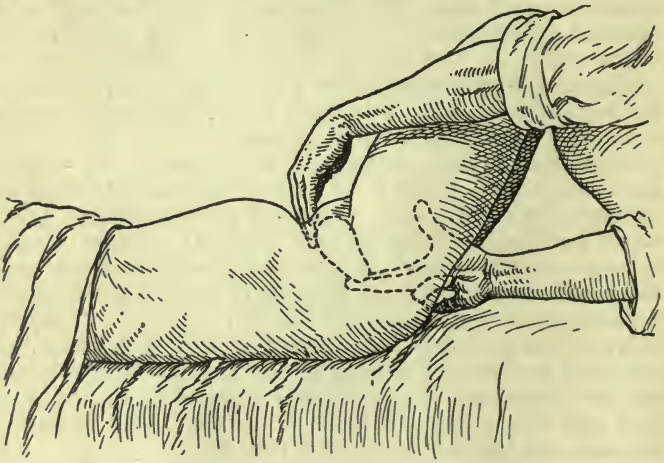


FIG. 23.—Bimanual examination.

EXAMINATION AIDED BY INSTRUMENTS

For a visual inspection of the vagina, a vaginal speculum is necessary.

Vaginal Specula.—The *Sims speculum* (Fig. 24) has a concave blade at each end. These are of different sizes for employment in vaginae of varying size. The examination with this speculum may be made in the left lateral position, in the dorsal position, with the patient's pelvis drawn to the side or end of the table or bed, or in the Sims position. Here the patient lies at the near side of the table or bed with both thighs flexed, the right more than the left. The left arm hangs over the near side of the bed or table, whilst the right arm is stretched upwards above the head. In this way the patient

lies partly over on her face and chest. The abdominal contents gravitate towards the table and a certain amount of

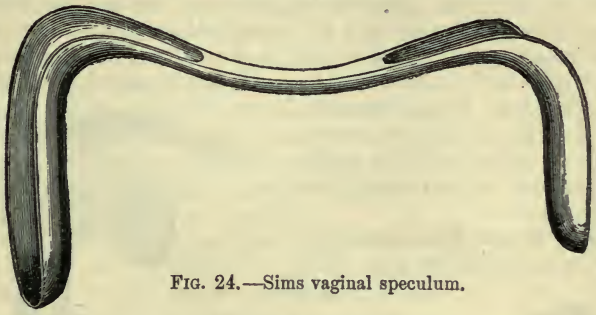


Fig. 24.—Sims vaginal speculum.

traction or suction is thus made on the pelvic viscera. When the vaginal orifice is opened, the walls are forcibly dragged apart, in response to the suction action operating from above, and a wide view of the walls and vault is obtained. For the examination good light is essential.

After the speculum is sterilised the outer convex surface of one blade is lubricated. The forefinger of the left hand hooks back the posterior vaginal wall, whilst the instrument is pushed in with the handle lying across the buttock, *i.e.* so that the width of the blade is in the antero-posterior or long axis of the vaginal orifice. After being introduced the handle is turned over the perineum and the vagina opened by a gentle pulling backwards of the posterior wall. The condition of the vaginal walls, and of the vaginal portion of the cervix, as also of the external os, and any tumour growth can be recognised on cervix or vagina or projecting into the vaginal cavity from the os.

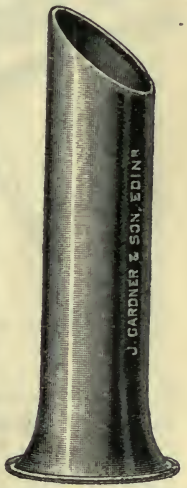


Fig. 25.—Fergusson's tubular speculum.

Likewise any application required to vagina or cervix for inflammation, erosion, etc., can be made.

Fergusson's Speculum (Fig. 25) is tubular and is introduced by a rotary movement. The examiner looks along the bore

during the introduction until the vaginal cervix is seen to bulge into the upper end. The instrument is now fully introduced, with the long side lying in the posterior fornix. The instrument allows of a good view of the vaginal portion of the cervix and the external os, and through it any antiseptic applications for "erosion" or inflammation, or the removal of a small polypus, may be carried out. So, likewise, as the instrument is being introduced or withdrawn the vaginal walls can be inspected.

The Bivalve Speculum (Fig. 26) is a useful instrument. The

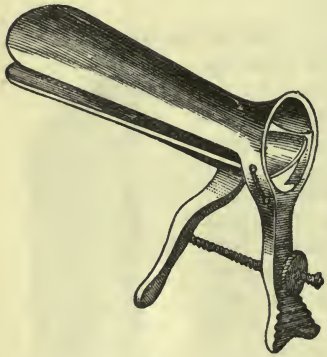


Fig. 26.—Bivalve vaginal speculum.

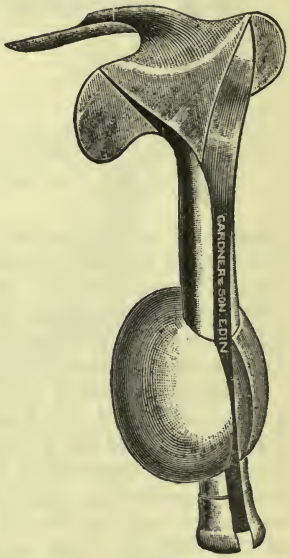


Fig. 27.—Auvard's self-retaining vaginal speculum.

blades are anterior and posterior. After introduction the blades are separated and fixed in position by the running screw. In this way the instrument is self-retaining.

Auvard's Speculum (Fig. 27) is weighted, so that, after introduction, the instrument holds back the posterior vaginal wall and is automatically held in position. It can only be used with the patient in the lithotomy position, *i.e.* at the end of the table, with the legs held up and out. It is only available for use under anaesthesia and is used largely for vaginal operations.

Uterine Sound (Fig. 28).—This is a probe of nickel-plated copper, which can be bent to any curve required. It is measured out by marks along its length, first at 2½ in., then at 3½ in., and at subsequent intervals of 1 in. It is used for introducing along the uterine cavity to determine the length of the cavity, the position of the uterus, the presence of any abnormal roughness or swelling in the uterus, and the relation of the uterus to any pelvic swelling, when this is in doubt.

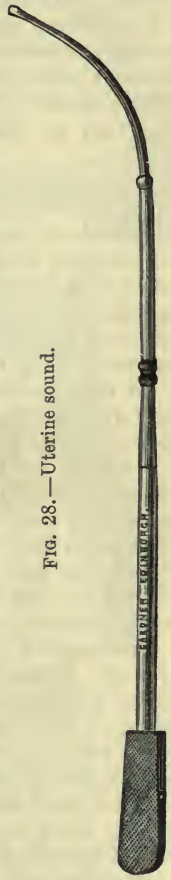


Fig. 28.—Uterine sound.

Careful asepsis is necessary in the use of the sound, and it should never be used, if there is the suspicion of pregnancy, unless as one method for terminating gestation. Bleeding from the uterus accompanying its use usually means pregnancy or some tumour, such as cancer or fibroid.

Another risk is perforation of the uterus. Some uteri are so soft that the sound perforates them easily. This risk demands care, though, in the case of a non-infected uterus, and where aseptic precautions have been taken, the accident need not cause alarm.

Bacteriological Examination of the Vagina and Uterus

In procuring a specimen of the discharge from the vagina or uterus for bacteriological investigation, it is important to avoid incidental contamination. A sterile swab similar to that used for throat examination is employed. If a specimen is desired from the vagina, the vulva is cleansed, and, the vaginal orifice being held open by the left hand, the swab grasped by the right hand is pushed into the vagina so that it does not touch the external surfaces.

To obtain a uterine swab, a speculum is introduced into the vagina. The vaginal walls are cleansed with swabs held on

long forceps. The vaginal cervix is seized and steadied by a volsellum forceps, whilst the sterile swab is inserted into the cervical canal without touching the vaginal surfaces.

In addition to removing material for cultural examination, the examiner should at the same time take away some of the discharge with a sterile platinum needle and make a smear on a clean slide. Gonococci are often recognised in the smear, when they are difficult to grow on culture media.

Examination of the Urinary System

Coincident infection of the urinary tract is common in gynecological disease. Urethritis is common in gonorrhoea, and cystitis is often present in such conditions as cystocele and prolapse, cancer, vesico-vaginal fistula, etc. So an intractable itching of the vulva (pruritus) may only be explained by the discovery of sugar in the urine.

An *examination of the urine* must, therefore, accompany every gynecological investigation. If infection is suspected, a specimen of urine free from accidental contamination should be removed for bacteriological examination. The labia are held apart, whilst the vulva and urethral orifice are carefully cleansed by sterile lotion. A sterile catheter is inserted, care being taken that the point of the instrument does not touch any of the surrounding structures. The escaping urine is collected in a sterile test-tube, which is closed by sterile gauze and despatched to the laboratory.

Examination of the bladder may be carried out by means of a *sound*. In this way the size and position of the bladder can be determined, as also the presence of a stone or concretion at the base of the organ. Calculi in the bladder are rare in women, because the relatively large size of the urethral lumen allows of the escape of the stone whilst it is still small.

A distended bladder forms an ovoid or rounded abdominal swelling rising in the midline above the pubis. Sometimes a bladder distended to a less degree can be felt bimanually, lying in the anterior segment of the pelvis, and bulging through the anterior vaginal wall.

Examination of the interior of the bladder is best carried out in the female by means of direct inspection by the aid of *vesical specula*. For this examination the patient lies either

in the genupectoral position or in the exaggerated lithotomy position. In the latter, the patient is placed at the end of the table, the legs being held up as in the lithotomy posture. An extra tilt is given to the pelvis by means of a firm pillow placed under the lower part of the back. The pitch given to the pelvis by the genupectoral or the exaggerated lithotomy positions causes the intra-abdominal contents to drag towards

FIG. 29. Urethral dilator.

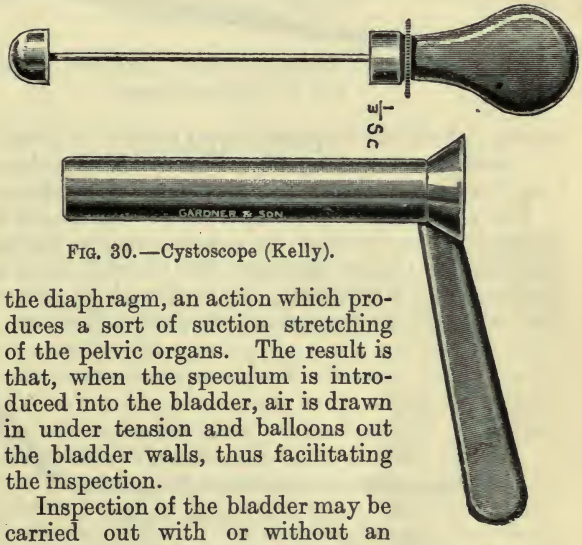


FIG. 30.—Cystoscope (Kelly).

the diaphragm, an action which produces a sort of suction stretching of the pelvic organs. The result is that, when the speculum is introduced into the bladder, air is drawn in under tension and balloons out the bladder walls, thus facilitating the inspection.

Inspection of the bladder may be carried out with or without an anaesthetic. The patient has to be supported in the position required for the examination. This may be done either by assistants or by a special trussing apparatus.

The instruments required for the examination are the urethral dilator, the specula, the bladder forceps, and urethral searcher.

Urethral dilator (Fig. 29).—This consists of a graduated metal cone by means of which the urethral canal can be dilated to the size required. The graduations indicate the amount of dilatation of the urethra obtained and the size of speculum required.

Speculum or Cystoscope (Fig. 30).—This is supplied in

different sizes. It consists of the speculum proper and the obturator, which is held in position during the introduction to prevent the inner end of the speculum injuring the urethra, and is removed when the speculum is passed into the bladder.

Bladder forceps (Fig. 31).—These are long, thin dissecting

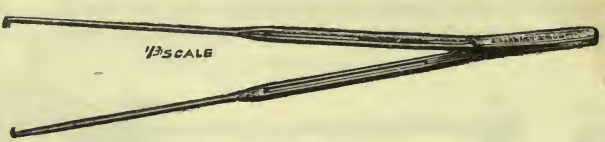


FIG. 31.—Bladder forceps.

forceps, which can be passed down within the speculum.

Ureteral searcher (Fig. 32).—This is a long probe carried on a curved handle for recognising the ureteral orifices.

The examination is carried out in a darkened room, and illumination is obtained by a laryngoscopic mirror fixed to the forehead of the examiner, and movable by a detachable handle, which is sterilised. By means of the mirror the light from an electric lamp is reflected into the bladder.

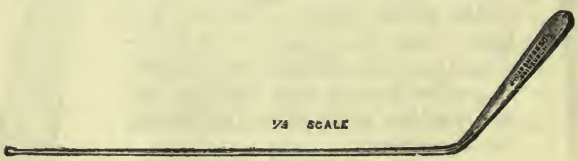


FIG. 32.—Ureteral searcher.

The general surface of the bladder walls is pale pink in colour in a normal case. The trigone, on the other hand, is of a deep red colour. By means of visual examination the presence of cystitis, ulcers, tumours, etc., can be recognised. The condition of the ureteral orifices and the nature of the urine trickling from each in turn is noted.

For a segregation of the urine from the two ureters, long ureteral catheters may be passed *via* the cystoscope. If the two catheters are left in position after the withdrawal of the cystoscope, the urine from the two kidneys can be collected separately in sterile tubes.

SECTION III
SYMPTOMS OF GYNECOLOGY

CHAPTER VIII

PAIN IN GYNECOLOGY—DYSMENORRHOEA—DYSPAREUNIA

THE upper limit of pain in gynecology may be stated generally as a girdle encircling the body at the level of the umbilicus. Tenderness of the breasts is sometimes present in gynecological ailments. It is also a frequent accompaniment of the menstrual period, when it is due either to a reflex stimulus or, more probably, to a congestion induced by the biochemical substance that arises in the ovary and that activates the breasts just as it activates the uterus at that time. The headache that often accompanies menstruation has probably a similar origin.

Apart from the pains just mentioned the sensory phenomena caused by disease of the genitalia are due to stimulation of the nerves in the diseased tissue. In some cases the pain is actually located in the parts affected. This **direct pain** is only possible where sensory nerves are present in the area in question, *e.g.* the vulva and perineum, or where a deep-seated inflammation spreads to a sensory surface, *e.g.* a parametritis pointing on the abdominal wall.

In the case of the internal genitalia one has probably usually to deal with **referred pain.** To understand this phenomenon one has to remember that, like other internal viscera, the internal organs of generation are in themselves insensitive to pain as they do not possess nerves of pain sensation. Their afferent nerves belong to the sympathetic system. Any stimulus passing upwards to the spinal cord along these nerves

is not felt as pain unless it is sufficiently severe to overflow on to the adjacent nerve-cells in the spinal cord, which are concerned with the reception of painful stimuli from the peripheral surfaces. It thus happens that where pain is felt in diseased conditions of the uterus, for example, it is attributed to a site on the abdominal wall, back, legs, etc., corresponding to the distribution of the sensory nerves which correspond in their origin to the segment of the spinal cord, into which the sympathetic nerves of the diseased viscus pass. The same applies to the Fallopian tube and probably also to the ovary.

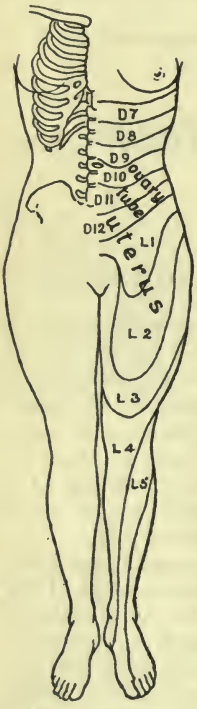


FIG. 33. — Segmental skin areas corresponding to pelvic viscera—front.

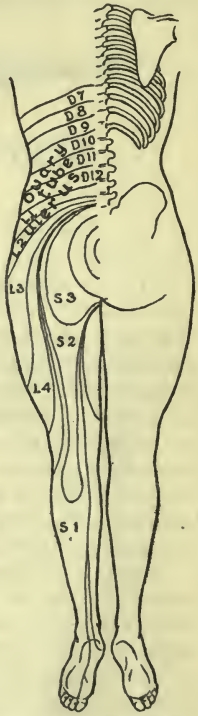


FIG. 34. — Segmental skin areas corresponding to pelvic viscera—behind.

Muscular rigidity of the abdominal wall, which commonly accompanies disease of the uterus and appendages, has probably a somewhat similar origin. The message passing upwards along the sympathetic nerves from the viscera overflows on to the cells in the cord, whose fibres supply the corresponding muscles, and down which a contraction stimulus is sent. This phenomenon of muscle rigidity is thus reflex in origin.

The localisation of pain in regard to disease of the genital organs still requires to be completely worked out. Figures 33 and 34 give in this connection an idea of the surface areas

corresponding to the underlying viscera so far as these are tolerably clear.

The sites and character of the different kinds of pain will be discussed in connection with the various diseases of the genital organs. Two types of pain specially characterised by their time of incidence require special notice here.

1. Dysmenorrhoea, or pain in association with menstruation.
2. Half-time pain, or pain midway between the periods.

DYSMENORRHOEA

This is defined as pain associated with menstruation. Where the pain precedes the menstrual flow by a day or two it is called *Premenstrual Dysmenorrhoea.* Where it coincides with the flow it is called *Menstrual Dysmenorrhoea.*

Etiology.—The factors causing dysmenorrhoea may be

1. Uterine.
2. Ovarian and tubal.
3. Congestion of peritoneum or connective tissue of pelvis.
4. Nervous.

Uterine Dysmenorrhoea

This may be produced in either of two ways : (*a*) congestion of the uterine wall, (*b*) obstruction to the menstrual blood.

(*a*) **Congestive Dysmenorrhoea** is the commoner of the two types of uterine dysmenorrhoea. It is easily accounted for by the *turgidity of the uterine wall,* which occurs at the height of the menstrual cycle. The blood-vessels are distended and in the mucosa a copious leakage of serum and blood occurs. These factors doubtless account for the pain where, as is often the case, there are no obvious signs of disease in the uterus. The congestion is then little more than physiological in nature.

Diseased conditions of the uterus, such as inflammation, fibroid tumours, cancer, and displacements, may induce a true pathological congestion. In these conditions the local tension of the tissues causes undue pressure on the uterine nerves. Another factor operating along the same lines in tumours or displacements is pressure on the uterine or ovarian veins.

The tumour or bending of the uterus, preventing the proper dilatation of the veins, in the presence of the added arterial flow that occurs during menstruation, will lead to a backward pressure and venous congestion of the whole uterine wall. This factor will obviously tend to induce another symptom commonly present in these conditions, namely, excessive haemorrhage.

Membranous Dysmenorrhoea is a diseased condition in which the endometrium is shed every month in the form of a cast. The cast is triangular in shape and, if it is carefully teased out, the orifices of the tubes and the internal os can be made out. In aggravated cases it consists of the whole thickness of the mucosa. In other cases it contains only the superficial layers. The etiology is unknown. It is associated with pain which is often very severe, and there is sometimes free bleeding.

The incidence of the pain in congestive dysmenorrhoea is characteristic. It commences a day or two before the period, *i.e.* it is premenstrual, and it stops with menstruation or extends into the first or at the most the second day of menstruation only. The establishment of the blood-flow brings about a relief of the congestion.

Many women who have no uterine disease suffer from this type of pain. Most women have a certain amount of discomfort or actual pain in the small of the back or the lower abdomen just above the pubis before and early in menstruation.

Uterine dysmenorrhoea of this type is much more common in unmarried women and girls, and is usually cured after marriage with the birth of the first child.

(*b*) **Obstructive or Spasmodic Dysmenorrhoea.**—Here there is an obstruction to the menstrual flow. It may be at the

1. Cervix.
2. Vagina.
3. Vulva.

Obstruction in Cervix.—This may be due to a tumour, *e.g.* fibroid or cancer, or atresia either congenital or acquired, *e.g.* after amputation of the cervix. Or it may be due to an exaggeration of the normal flexion of the uterus at the internal os, *e.g.* acute anteflexion or retroflexion, which kinks the canal

and thus dams back the menstrual discharge, and induces painful expulsive efforts on the part of the uterus. In association with congenital cases of acute anteflexion and of retroflexion there is often an additional factor in the shape of narrowing of the cervix. In these cases the vaginal portion of the cervix is very small and conical and is surmounted by the so-called " pin-hole os."

Obstruction in Vagina or Vulva.—Here there is complete closure of the vagina or vulva due to congenital or acquired factors, and the menstrual flow accumulates month by month in gradually increasing quantities behind the obstruction. This condition is described as concealed menstruation and is associated with menstrual pain and, in the later stages, abdominal swelling (see page 283).

Ovarian and Tubal Dysmenorrhoea

The commonest cause of this type of dysmenorrhoea is *subacute and chronic inflammation of the tubes and ovaries.* The pain is due to the fact that the menstrual congestion produces an exacerbation of tension in the chronically inflamed organs. The chronic pelvic peritonitis present in these cases is an additional cause of the menstrual pain.

In some cases of purulent salpingitis, the outflow of lymph that accompanies the menstrual congestion causes a rise of tension in the tube and may force some pus from the tube into the peritoneal cavity. This can occur only comparatively rarely, for in most cases of purulent salpingitis the abdominal opening of the tube is closed early. When a leakage occurs it is evident that it may at any moment be followed by a severe peritonitis.

Tumours of the ovaries and tubes may be accompanied by menstrual pain. On the other hand, large ovarian tumours may be present without any dysmenorrhoea.

Prolapse of the ovary in the pouch of Douglas may be associated with menstrual pain, but in this case other factors, *e.g.* inflammation, are usually present.

Ovulation.—The local hyperaemia in the ovary associated with maturation of the follicles, apart from the congestion incidental to menstruation, may in some cases be accompanied by pain. It is doubtful if this ever occurs in the healthy

ovary, though it may be partly responsible for the discomfort that even healthy girls suffer. In some cases the rupture of the follicle is associated with the leakage of a quantity of blood into the peritoneal cavity. These cases are especially apt to be associated with severe pain.

The incidence of the pain in adnexal disease may be premenstrual or menstrual or both. In many cases it is both premenstrual and menstrual. Unlike the uterine dysmenorrhoea the pain here is lateral, the commonest position being just above the outer end of the inguinal ligament. If the disease affects the appendages on both sides the pain will be bilateral. Pain in the small of the back and sacral regions is also commonly associated with ovarian and tubal disease.

It is noteworthy that the pain associated with adnexal disease is much more prominent on the left side than on the right. This does not mean that disease of the appendages is more common on the left side. It is doubtless due to the presence of the rectum and pelvic colon on the left side and to the fact that distension or the peristaltic activity of the bowel will tend to disturb the inflamed structures on that side.

Pain due to Congestion of Peritoneum or Connective Tissue of Pelvis

Localised pelvic peritonitis practically always accompanies tubal inflammation, and this is a factor contributing to dysmenorrhoea in these cases.

So in *chronic appendicitis*, where the appendix dangles over the pelvic brim, it often becomes adherent to and induces an inflammatory change in tube and ovary. In these cases, of course, the maximum pain is felt on the right side. In the typical case the symptoms suggest an ordinary attack of appendicitis precipitated in a recurring fashion at the menstrual periods, and associated with tenderness on pressure over the appendix region.

Inflammation of the connective tissue of the pelvis (parametritis) is usually due to infection occurring through a torn cervix or vagina at or after labour. When it becomes chronic it is often associated with a congestive type of dysmenorrhoea.

In all these cases the pain is premenstrual, passing over into the first or second day of the flow.

Nervous Dysmenorrhoea

In many cases there is no disease in the pelvis sufficient to account for the dysmenorrhoea, and this is more marked than can be explained by a congestion of the uterus or appendages. In many such, the only explanation is that it has a neurasthenic basis. Women vary greatly in their tolerance of pain, and there is no better demonstration of this than in the varying degrees in which different women respond to the local phenomena of menstruation. These are presumably very similar in their ultimate nature in all women whose organs are normal. One woman suffers no or only mild discomfort, whereas another suffers in a degree that is agonising to herself and a source of great anxiety to her friends. Girls of a nervous, excitable disposition are more likely to suffer. That there is no pathological basis for these cases is shown by the frequent cessation of the symptoms after marriage and the birth of the first child, when a new series of phenomena demands the attention of the mind.

Treatment of Dysmenorrhoea

Dysmenorrhoea being a symptom, it is important to diagnose the cause. Any gross disease, such as displacements, fibroids, tubal or ovarian disease, parametritis, etc., will be dealt with as described under the corresponding chapters.

In these cases the diagnosis and treatment are usually simple. In the absence of any obvious disease it is often a matter of considerable difficulty to know what to do. This class of case consists almost entirely of young girls or women who are unmarried or are married without children.

In a woman who suffers from severe dysmenorrhoea and who has been married for two or three years without conception, dilatation of the cervix should always be recommended. It is unnecessary in these cases to curette the uterus, for the endometrium is practically always healthy. Rather, as little interference as possible should be carried out, and arrangements should be made for the woman to receive her husband as early as possible, so that the best chance for conception is given. Pregnancy and labour are the best cure for such cases. It is almost infallible.

In the unmarried girl and young woman with no evident

disease or only a degree of acute anteflexion, the treatment is sometimes difficult. Sedative drugs such as aspirin, phenazonum, viburnum, pulsatilla, etc., may be tried and, in a nervous patient, they may give sufficient alleviation of pain which is not too severe or too protracted. The establishment of a drug habit is always a danger in such cases and has to be sedulously avoided.

Sometimes a change of occupation is all that is required, as is seen in the fact that girl clerks and typists, who suffer at ordinary times, have no trouble during their holidays. It is often, however, only in the better class of patient that such a change can be arranged.

If drugs fail then, as they usually do fail, to give any marked relief, *dilatation of the cervix* with metal dilators should be carried out. The dilatation should be carried out to the fullest possible extent short of causing a cervical tear. If this happens, even with careful asepsis and antisepsis, an infection may occur which makes the end result worse than the original condition. For a similar reason such cutting operations as that of Dudley are not to be recommended. It is neither necessary nor advisable to curette the uterus in these cases.

In membranous dysmenorrhoea, dilatation and curettage should be carried out, though in some cases no remedy short of hysterectomy is helpful. This drastic method of treatment will, of course, only be adopted in very aggravated cases.

HALF-TIME PAIN

This is a comparatively rare condition. The pain comes on midway between the periods and recurs in a rhythm often regular to the day. It may last for some minutes or hours or a day or two. It may be slight or, as in many cases, it may be intense. It is usually located in the lower abdomen in the midline or to one or the other side, or it may be in the small of the back. On the other hand, it may be situated in the perineal or anal region. The writer has met with a case in which, after an operation for appendicitis, the half-time pain recurred with unfailing regularity in the anal region.

The **etiology** is unknown. It is usually understood to be associated with disease of the tube or ovary. Its time of incidence does not easily lend itself to an explanation based on

tubal disease. It is possible that it is dependent on a certain stage in the ovarian cycle of changes. By some, ovulation is supposed to occur at a definite time midway between the periods.

Treatment.—This will consist in palliative measures such as sedative drugs, and methods directed to the treatment of a possible tubal or ovarian inflammation.

DYSPAREUNIA

This means pain or difficulty in the performance of the sexual act.

Etiology.—This may be found in the *vulva* or *vagina*, caused by such conditions as inflammation, kraurosis, ulceration, tenderness of the carunculae myrtiformes, undue narrowing of the hymeneal opening, or actual closure of the vaginal orifice by a septum. In the condition of vaginismus, the muscles of the vaginal opening are thrown into a tender spasm, and this may be so great as to render coitus intolerable to the woman. In such cases there may be a local cause in the shape of an ulcerated hymen. Sometimes, however, there is no local cause and the only explanation is a neurosis. Urethral caruncle is often associated with dyspareunia.

In other cases the cause is found in deep-seated *inflammation in the pelvis, e.g.* salpingo-oöphoritis, parametritis. *Prolapse of the ovary* into the pouch of Douglas is another important cause.

Treatment.—This is directed to the cause present. Local conditions, such as a caruncle, an ulcer, or tender carunculae are treated by surgical means. The treatment of vaginismus is often difficult. If due to an unduly narrow orifice, dilatation by operation (see p. 304) or instruments may be adopted. In some cases the employment of a 5 per cent cocaine ointment half an hour before coitus may cure the condition.

Deep-seated inflammations are dealt with by the appropriate measures. It is well to remember that abstention from coitus may be a necessary element in the palliative treatment of a salpingo-oöphoritis. In some cases the irritation of coitus keeps the inflammation alive. Prolapse of the ovary, if associated with retroflexion of the uterus, is treated by a pessary introduced to hold the uterus forwards. In some cases an abdominal operation is necessary.

CHAPTER IX

AMENORRHOEA—HAEMORRHAGE

AMENORRHOEA

Amenorrhoea means the absence of menstruation. As a physiological condition it is seen before puberty, during pregnancy and lactation, and after the menopause.

After its establishment at puberty the absence of the menstrual flow under any conditions other than the above is considered as pathological.

Amenorrhoea is usually divided into two types

1. Primary. 2. Secondary.

Primary Amenorrhoea

In this the amenorrhoea is primary, that is the onset of menstruation, which occurs on the average in this country at the age of 14 or 15 years, is delayed. Individual differences within physiological limits are so marked that a delay for a year or two need not necessarily cause anxiety. But the delay of the menarchē till 17 or 18 years should be considered as pathological.

Primary amenorrhoea may be due to (*a*) congenital or (*b*) acquired factors.

Congenital.—Under this heading fall the cases associated with a *mal-development of uterus or ovaries, or both.* In these the prognosis as regards the reproductive functions is always gloomy. It is rarely possible for the girl to gain her menstrual functions and the power of child-bearing.

Then there are cases of *atresia of the vagina* or vaginal orifice. In this, although the menstrual function is established, the presence of a congenital septum, usually at the lower end

of the vagina, blocks the genital canal and prevents the escape of the blood. This condition is sometimes called concealed menstruation, for the blood, which is secreted by the uterus each month, is dammed back behind the barrier and accumulates. It first distends the vagina, producing the condition called haematocolpos. After a time the vagina, greatly expanded by blood, may actually form an abdominal swelling. Later the cervix (haemato-trachelos), the uterine body (haemato-metra), and the Fallopian tubes (haemato-salpinx) may become distended by the retained blood (Fig. 146). In concealed menstruation there usually are the molimina of menstruation, headache, pain in the back, etc., and the mother in the beginning expects the appearance of the flow from month to month. After a longer or shorter time the aggravation of the symptoms, and swelling of the abdomen due to distension of the vagina, rouses her suspicion that something unusual is present.

Acquired.—In this the primary amenorrhoea is due to some condition acquired between birth and puberty. The commonest cause is *anaemia*. The delay in the onset of the periods is often due to this simple cause and is easily put right.

Acquired *disease of the genitalia* may be present. This is a rare cause. Inflammation of the vulva in the child may cause an adhesion of the lips of the hymen or of the labia minora and cause an *acquired atresia* similar in its results to the congenital and commoner type.

A disturbance of the equilibrium of the endocrine glands due to congenital or acquired causes may cause a primary amenorrhoea. Under this heading would fall cretinism, which is due to deficient thyroid secretion, and which may be associated with amenorrhoea.

Secondary Amenorrhoea

Here the menstruation is suspended at any time after it has been established at puberty. Under this heading would fall the physiological conditions of pregnancy and lactation.

The pathological causes are many.

Anaemia.—Chlorosis is an important cause of suspended or diminished menstruation in girls. Simple anaemia may operate in this way at any time during the reproductive life of a woman. The more severe anaemias, such as splenic anaemia

and pernicious anaemia, and the anaemias of phthisis, syphilis, heart disease, and kidney disease, and any disease associated with debility, may all be associated with amenorrhoea.

Nervous Factors.—Any severe nervous shock may lead to a suspension of menstruation. The death of a fiancé or husband may be cited as examples; this factor operated during the past war. In some women, who are anxious to have a baby, the power of auto-suggestion may become so potent that the symptoms of pregnancy are counterfeited. Amenorrhoea sets in and, in cases of pseudocyesis or spurious pregnancy, there may occur a gradually increasing distension of the abdomen, though the uterus retains its normal size.

Ovarian disease, if extensive enough to lead to a destruction of the secreting tissues of the ovary, may induce amenorrhoea; for example, chronic inflammation or advanced cystic or malignant tumours.

Superinvolution.—In this the atrophy of the uterine wall which occurs after labour, and which leads to a return of the puerperal uterus to its normal non-pregnant size, has occurred to an excessive degree. The result is an impairment of the uterine function which may be permanent.

Premature menopause.—Complete removal of both ovaries for tumour or inflammatory disease causes an immediate and permanent suspension of menses. In some women, for no apparent reason, menstruation may be suspended at an early age, and despite every method of treatment may never return. So, if insufficient precautions are taken by a nurse who works in an X-ray room, an amenorrhoea may be induced as the result of the destructive action the rays exert on the ovarian cells. So also amenorrhoea may be produced in cases where rays are employed in the treatment of fibroid tumours and other conditions of the uterus associated with haemorrhage.

Diseases of the Endocrine Glands.—The commonest example under this heading is myxoedema, where the thyroid deficiency is associated with amenorrhoea. This is often cured after the administration of thyroid substance. It is possible that cases of premature menopause are of a similar origin. Some such cases may be due to early suspension of the ovarian function due to factors which are at present unknown.

Atresia of Vagina or Cervix.—Acquired closure of the cervix following trauma or after operation, such as amputation

of the cervix, may lead to a sealing of the menstrual flow in the uterus and tubes, producing a haematometra and haematosalpinx. So, following ulceration of the vagina, due to disease or trauma, there may be a blockage of the vagina. These conditions all lead to so-called concealed menstruation, and give rise to the symptoms which have already been described.

Treatment of Amenorrhoea

This will be directed to the cause responsible. In cases associated with anaemia, iron should be administered. Where the anaemia is secondary to some debilitating disease, such as phthisis, syphilis, etc., the appropriate treatment in each case will be administered. In myxoedema thyroid extract is given. In other conditions, where some altered state of the internal secretory organs is suspected, the administration of ovarian, thyroid, or pituitary extract may be helpful in some cases. So far, however, the physiology and pathology of the endocrine glands is so imperfectly known that any treatment carried out along these lines is empirical. Even the administration of ovarian extract after operative removal of the ovaries is only rarely attended with a persistence of the menses and the other ovarian functions.

Amenorrhoea due to mal-development of the internal generative organs is always permanent and hopeless from the point of view of treatment.

The treatment of concealed menstruation due to atresia of the vulva, vagina, or cervix will be described under the local headings.

HAEMORRHAGE

Haemorrhage plays an important part in the physiology of the genital organs, and it is a fact of interest in comparative physiology that bleeding as a normal process is specially found in the human species and the higher monkeys. In man the reproductive process is accompanied by haemorrhage in the ovary, where it is an important accompaniment of the final stage of maturation of the follicle, and in the uterine mucosa, where it is seen both in menstruation and in pregnancy.

Being such an important accompaniment of the physio-

logical changes, it is not surprising that disease of the genital organs is often associated with excessive haemorrhage.

Haemorrhage in association with the female genital organs may be : 1. Intra-abdominal. 2. Concealed in the Genital Canal. 3. External.

Intra-abdominal Haemorrhage.—The commonest cause of this is rupture of the sac of a tubal pregnancy. In these cases the haemorrhage may be gradual and slight or it may be sudden and great and associated with severe collapse. Other rarer causes of internal haemorrhage are leakage from the Graafian follicle during dehiscence of the ovum, or rupture of one of the distended veins which are sometimes found coursing across the surface of a fibroid tumour. Very rarely the bleeding is due to a breach in the sac of an ovarian pregnancy. In obstetrical practice internal haemorrhage occurs with rupture of the uterus.

Concealed Haemorrhage.—In obstetric practice, in cases of accidental haemorrhage, even a large accumulation of blood can occur between the placenta and membranes and the uterine wall before any external escape occurs.

In cases of tubal pregnancy, if the sac ruptures into the lumen of the tube this becomes distended with blood to form a haematosalpinx. This is often associated with intra-abdominal bleeding.

Finally, in atresia of the cervix or vagina the menstrual blood accumulates behind the septum to form a gradually increasing sac. This condition of concealed menstruation has already been discussed under amenorrhoea.

External Haemorrhage.—Before deciding that the genital tract is the origin of the bleeding, it is necessary first of all to exclude the anus and rectum and the urinary tract.

Bleeding may be from the *vulva or vagina*. Thus, in most cases, a certain amount of bleeding, usually slight, though it may be severe, accompanies the first performance of the sexual act and the rupture of the hymen. Bleeding may likewise follow laceration of the vulva or vagina after rape or during labour. Sometimes it is caused by the rupture of a distended vein of the vulva or vagina which may become varicose during pregnancy. So the discharge from an ulcer or an ulcerating tumour of the vulva or vagina may be haemorrhagic.

In the great majority of cases external haemorrhage is uterine in origin.

ABNORMAL UTERINE HAEMORRHAGE

Before Puberty

Uterine haemorrhage before puberty is rare, except in the case of *haemorrhage of the new-born.* After birth a slight discharge of blood from the vagina is not uncommon. It is usually very slight, lasting for a few hours or days. It is of no clinical significance and passes off without any untoward effects. It is probably due to some temporary endocrinitic action and it is sometimes associated with a passing mammary activity, which is also a not infrequent condition in new-born infants.

Haemorrhage due to Disease of the Uterus or Ovaries.—In the later years of childhood the existence of uterine haemorrhage should rouse the suspicion of malignant disease of the uterus or ovaries, though in some instances it may be due to a simple congestive or infective process in the uterine mucous membrane.

Haemorrhage before the ordinary time of puberty may mean nothing but a premature puberty. It should be remembered that pregnancy may occur before the onset of menstruation, and haemorrhage may, in these cases, be due to threatened abortion.

After Puberty

Haemorrhage after puberty is usually divided into two classes :

1. Menorrhagia—Excessive loss at menstruation.
2. Metrorrhagia—Haemorrhage between the periods.

This subdivision has some advantages from the point of ease in clinical description, but it has little foundation in pathology. In general terms it may be said that in many gynecological ailments the excessive loss commences as menorrhagia. But the same ailments, if more marked, or if operating over a long time, result in metrorrhagia.

Etiology.—The causes of uterine haemorrhage are :

1. Puberty.
2. Pregnancy.
   - (*a*) Interruption of the course of pregnancy.
   - (*b*) Post-partum haemorrhage.
   - (*c*) Retention of pieces of placenta.

3. Chronic Infection of the Uterus.
4. Tumours of the Uterus.
5. Diseases of the Tubes and Ovaries.
6. Chronic Inflammation of the Pelvic Cellular Tissue—Parametritis.
7. General Disease.
8. Menopause.

Puberty.—Before a menstrual flow becomes properly established and regular there may be times of excessive loss.

Pregnancy.—*During reproductive life the commonest causes of haemorrhage are to be traced to pregnancy.*

(*a*) *Interruption of Pregnancy.*—Abortion or premature labour is ushered in by haemorrhage, which persists till the uterus is emptied. So a pregnancy vitiated by hydatidiform degeneration of the chorion is associated with bleeding. Accidental haemorrhage in pregnancy with separation of the placenta is usually followed by external bleeding.

(*b*) *Post-partum Haemorrhage.*—Injury of the cervix at labour or rupture of the uterus is attended by external bleeding. The other causes of post-partum bleeding are discussed in text-books of midwifery.

(*c*) *Retention of Pieces of Placenta.*—This constitutes an important cause of haemorrhage persisting after abortion or labour. In the majority of cases a piece of adherent placenta becomes spontaneously separated, but it may remain attached to the uterine wall and maintain a haemorrhage lasting for years.

Portions of a hydatidiform mole retained in the uterus provoke and maintain an intractable bleeding.

Where fragments of chorion are retained they are prone to undergo a malignant change. This is specially true of hydatidiform degeneration, which is apt to pass on to the condition of chorionepithelioma.

Chronic Infection of the Uterus.—This is one of the most fertile sources of uterine haemorrhage. It causes a thickening of the endometrium, chronic endometritis, and a chronic inflammation of the muscular wall, chronic metritis. Subinvolution, which in the majority of cases is due to an infection at childbirth, is a common cause of persisting haemorrhage. The haemorrhage of retrodisplacements of the uterus is pro-

bably largely due to a chronic infection of the uterus, though, in some cases of acute flexion, the mechanical interference with the natural expansion of the veins at the angle of bending will tend to a backward congestion of the endometrium during menstruation, thus causing an excessive flow of blood.

A chronic inflammation of the cervix, and so-called erosion, may, in rare cases, be accompanied by haemorrhage.

Tumours of the Uterus.—Fibroids, mucous polypi, cancer, and sarcoma are all associated with uterine haemorrhage. Fibroids and mucous polypi are a very common cause of bleeding in women under 45. Malignant disease is the commonest cause in women towards the menopause.

Diseases of the Tubes and Ovaries.—Many cases of chronic inflammation of the tubes and ovaries are associated with haemorrhage. This may be partly attributable to the chronic pelvic congestion accompanying these cases, and partly to the endometritis often present. It is likely that, in some, the chronic inflammation of the ovary causes a disturbance in function with an excessive secretion of hormone. The same factor may operate in the case of ovarian tumours, where uterine haemorrhage may be a marked symptom. This is especially the case in some malignant tumours. Torsion of the pedicle of a simple ovarian cyst may be followed by uterine haemorrhage.

In tubal pregnancy the death of the foetus in the adventitious sac is followed by a detachment of the uterine decidua and haemorrhage. Where the foetus continues to grow, intermittent uterine bleeding is a common symptom.

Parametritis.—Chronic infection of the pelvic cellular tissue is often accompanied by menorrhagia, due to the general pelvic congestion present. Of course, in some of these cases it is really due to a concomitant endometritis.

General Diseases.—Diseases specially characterised by a tendency to haemorrhage may be associated with uterine bleeding, *e.g.* pernicious anaemia, leucocythaemia, Bright's, and mitral disease. The anaemia of any debilitating disease, *e.g.* cancer, may be accompanied by uterine haemorrhage. In these cases a vicious cycle is established, the anaemia causing a uterine loss of blood, and this in its turn increasing the debility and the anaemia.

Menopause.—Just as puberty may be associated with

irregular and excessive periods, so, at the end of reproductive life, before the final cessation of menstruation, the periods may swing for some time between an excess and a diminution. *In all cases of excessive haemorrhage at this time cancer of the uterus should, however, be suspected until it has been excluded by careful examination.*

Some cases of menopausal and post-menopausal haemorrhage are due to senile endometritis or to degenerating fibroid tumours.

Haemorrhage at Different Periods of Life

The causes of uterine bleeding operate in different degrees at different periods of life. The various factors are shown in their order of importance at different periods as below. The common causes are shown in italics.

Period.	Cause.
At Birth—	Probably *hormonal.*
Before puberty (rare)—	Malignant disease of uterus.
	Malignant ovarian tumours.
	Infection.
Puberty to 20—	*Pregnancy.*
	Infection.
	Mucous polypi.
	Sarcoma of uterus (rare).
	Malignant disease of ovaries (rare).
20–30—	*Pregnancy.*
	Infection.
	Mucous polypi.
	Fibroids, cancer, sarcoma, chorion-epithelioma (rare).
30 to menopause—	*Pregnancy.*
	Infection (*endometritis*, fibrosis).
	Mucous polypi.
	Fibroids.
	Cancer.
	Sarcoma, chorionepithelioma (rare).
After menopause—	*Cancer.*
	Fibroids.
	Pregnancy.
	Infection.

CHAPTER X

LEUCORRHOEA—STERILITY

LEUCORRHOEA

In normal health there should be no discharge from the vagina. A very large number of women, however, suffer from the escape of a white fluid, popularly known as "the whites." It is more common in married than in unmarried women. Its characters vary according to the causal agent present.

Etiology.—In a large number of cases the *menstrual congestion* of the pelvic organs is associated with an increase of the normal secretions, and there is the escape of a watery or milky exudate for several days before or after the menstrual flow. In these cases there may be no disease of the pelvic organs.

Infection of the genital organs is the invariable cause of a persistent and copious leucorrhoea. In mild and chronic cases the discharge is white or cream-like; in acute cases it is yellow and purulent. Such conditions as *acute gonorrhoea* or *acute infection at labour*, or the presence of a *cancer* of the cervix or a *sloughing fibroid*, are associated with a purulent exudate, which, especially in the last two conditions, is often foul-smelling. In an out-patient department the presence of a cancer or a stinking fibroid polypus can be detected by the smell alone. In gonorrhoea, in the early stages, the discharge is derived from the vulvar surfaces, which are bathed in a purulent exudate.

In the majority of cases a persistent leucorrhoea is due to a *chronic infection of the uterus*, and especially to *chronic cervical catarrh*. The most common site of chronic inflammation in the genital canal is the cervix. After infection at

labour or an abortion, or after gonorrhoea, a catarrhal state of the cervix is often established, which is associated with a chronic leucorrhoeal discharge containing thick glairy mucus derived from the cervical glands. An infection of the cervix of a similar kind is not uncommon in the virgin. The vagina contains bacteria from the beginning, and in girls any condition causing enfeeblement of health, such as chlorosis, may be associated with a catarrhal cervix and leucorrhoea.

In cases of chronic infective leucorrhoea the discharge often increases in amount before and after the menstrual period.

The constant leakage of fluid may lead to an enfeeblement of the system of the patient in cases of chronic leucorrhoea. In most of these cases, however, the lowered vitality that often accompanies the leucorrhoea is probably dependent on a chronic absorption from the infective focus present, usually the cervix.

Treatment.—As leucorrhoea is merely a symptom, the treatment will be directed to the cause present. When due to enfeebled health, general tonic treatment with change of air will be adopted. In chronic cervical catarrh, mild antiseptic douches (*e.g.* lysol, 1 teaspoonful to the pint of water) may give great benefit. Failing this, it may be necessary to remove the infected surfaces by the curette or the knife.

STERILITY

This means the absence of conception during married life over a period of years. It is convenient to select a period of four years, though a woman may conceive after remaining barren for fifteen or twenty years in the absence of any gynecological treatment.

Sterility may be due to the husband. It has recently been stated on fairly good grounds that sterility is due to the male in 16 per cent of cases. This being so, it is evidently unscientific and unjust to submit the woman to an operation until the competence of the man has been established.

Incompatibility as a cause of sterility is a condition about which little is known. Its existence has been repeatedly established in the case of a man and wife who are mutually sterile and yet who, after divorce, each have children in a new marriage. A similar condition is found in the lower animals.

A stallion and a mare may, for example, be sterile with one another and yet each may breed with other mates.

Sterility of a definitely gynecological nature is divided simply into two classes depending upon the cause, namely, (1) congenital and (2) acquired.

Sterility due to Congenital Causes.—Under this heading are included *mal-developmental defects* of the uterus, tubes and ovaries, and vagina. In some, *e.g.* a rudimentary state of the uterus, the sterility is incurable. In others, *e.g.* atresia of the vagina, the condition may be cured by simple surgical measures. So, in acute anteflexion of the congenital type, dilatation of the narrowed cervix, which usually accompanies the malposition, may cure the sterility.

Sterility due to Acquired Causes.—Here the condition is due to factors acquired after birth. The causes may operate between birth and puberty or after puberty.

Factors operating between Birth and Puberty.—Under this heading will fall a *vulvitis*, which leads to a fusion of the labia minora or the edges of the hymen, thus causing an acquired atresia. Or it may be due to *bilateral removal of the ovaries* in the child for disease.

Factors operating after Puberty.—Under this category are embraced practically every form of gynecological disease to which a woman is subject during her reproductive life.

Infection is probably the chief single cause of sterility. Gonorrhoea and infection dating from an abortion or a labour are the dominating causes of an acquired sterility. A woman who is infected at labour or by a gonorrhoea may remain permanently sterile because of the damage to the cervix or uterine body or because of the chronic salpingo-oöphoritis which supervenes in the later stages. The closure of the fimbriated ends of the tubes and the strangling of the ovaries in inflammatory adhesions are two common sequelae of infection.

Displacements, e.g. retroversion, retroflexion, and prolapse, are common causes of sterility. In retrodisplacements, especially, the loss of fertility may be due more to the chronic inflammatory condition of the tubes and ovaries which often accompanies a retrodeviation. Sometimes, however, the mere mechanical reposition of a retrodisplaced uterus and the introduction of a pessary is followed immediately by conception.

Tumours, e.g. fibroids, cancer, etc., are a common cause of sterility. So, bilateral ovarian tumours may cause sterility by causing destruction of the ovarian functioning elements.

Vaginismus, due to local causes, such as urethral caruncle or kraurosis, may induce sterility by preventing coitus. Sometimes it is found that some local or neurasthenic factor has prevented coitus, and consummation may never have taken place even years after marriage.

Bilateral removal of the ovaries for inflammation or tumour growth causes sterility.

Atresia of the canal is an occasional cause of sterility acquired after puberty. Closure of the vagina after ulceration may occur, or of the cervix after operation.

Treatment.—The treatment of *congenital* sterility is directed to the developmental defect. In atresia of the vagina (*q.v.*) the removal of the septum is carried out. In congenital anteflexion a dilatation of the cervix may cure the condition. In the major conditions associated with a rudimentary state of the uterus and tubes or an absence of the vagina, treatment is of no avail.

Acquired sterility is treated by the removal of the cause in such cases as an atresia of the vagina or cervix or Fallopian tubes, displacements, vaginismus, etc. A fibroid tumour may occasionally be removed from the uterus by myomectomy and pregnancy be subsequently possible. The prognosis, however, in such cases is bad because the tumour usually implies a hysterectomy as the only possible method of treatment.

Inflammatory conditions in the pelvis are treated in the ways described under the appropriate regional headings.

SECTION IV

DISPLACEMENTS OF THE UTERUS

CHAPTER XI

ANTERIOR DISPLACEMENTS OF THE UTERUS

THE displacements to which the uterus is subject are :

1. Anterior.
2. Posterior.
3. Downward—prolapse.
4. Downward—inversion.
5. Lateral.
6. Upward.

ANTERIOR DISPLACEMENTS OF UTERUS

The anterior displacements of the uterus are (1) anteposition, (2) acute anteflexion.

Anteposition.—Here the whole uterus is displaced forward up against the pubis. The most common cause of this is an ovarian or uterine tumour which, growing behind, pushes the uterus further and further forward.

ACUTE ANTEFLEXION

This consists of an exaggeration of the normal angle of flexion existing between uterine body and cervix. Instead of being obtuse the angle becomes acute.

Varieties.—1. Congenital.
2. Acquired.

Congenital Acute Anteflexion

This is a common condition; it is often the only abnormality present in young women who consult the gynecologist (Figs 35 and 36).

Etiology.—This is unknown. The condition is apparently intra-uterine in origin and is apt to be associated with an imperfect development of the uterine substance as well as of the tubes and ovaries. For this reason it is more accurately

Fig. 35.—Normal position of uterus.

Fig. 36.—Congenital acute anteflexion.

described as a mal-development. The altered position is more a malposition than a displacement.

Pathology.—The body and cervix are smaller than usual. The cervix is typically conical in shape and ends in a small, so-called "pin-hole os." The cervical canal is narrowed, and the acute angling between body and cervix renders the internal os small also. The diminished size of the uterus is due to the deficient development of muscle, and a uterine sound not infrequently passes the normal length into the uterine cavity, *i.e.* 2½ in. The endometrium is normal.

Coincident with the small uterus the tubes and ovaries may be small and imperfectly developed.

Symptoms.—Many cases of congenital acute anteflexion are

symptomless, and the condition is discovered accidentally. The two cardinal symptoms when such are present are (1) dysmenorrhoea and (2) sterility.

The *dysmenorrhoea* usually dates from puberty. It accompanies the menstrual flow and is often spasmodic, suggesting powerful and recurring uterine contractions. It is felt in the midline just above the pubis. It is probably dependent on a mal-developmental defect, which produces spasm or which renders the ordinary uterine contraction painful, and it is partly due to the narrowing and angling of the uterine canal.

The *sterility* is due to the narrowing of the canal or to the poor development of the uterus and ovaries. In the one case it may be overcome; in the other it is incurable.

Signs.—The vulva and vagina are non-parous, as one is always dealing with a patient who has had no children. In an unmarried woman a vaginal examination should only be made under anaesthesia; in such a case a rectal examination will often give all the information required.

The cervix is narrow and pointed and the os is minute. On bimanual examination the small round body can be felt in front tilted down to form an acute angle with the cervix.

Diagnosis.—Occasionally the cervix is directed downwards and forwards, and unless care be taken in such a case an erroneous diagnosis of congenital retroversion may be made. In other instances a small fibroid placed on the anterior wall of the uterus low down may simulate an acute anteflexion.

Treatment.—Spontaneous cure of the dysmenorrhoea occurs after pregnancy and labour, if this happy result should follow marriage.

Medical treatment for the pain is usually futile, and it is unwise, in the ordinary case, to commence the administration of sedatives, such as antipyrin and phenacetin, for it is apt to pass into a dangerous habit. For slighter cases, or where operation is either refused or is inadvisable, mild sedatives may be guardedly employed every month, the drug being given just before the period is due and continued during the period.

Stem pessaries, such as were used in the old days, and which were pushed into the cervix with the object of straightening the uterus and at the same time of dilating the canal, are to be avoided because of the risks of sepsis, which their employment entails.

Operative treatment consists of *dilatation of the cervix.* This cures the dysmenorrhoea in many cases, though by no means in all, and in a married woman it promotes the chance of pregnancy. It is well in such a case to interfere as little as possible. Curettage should never be done, as the endometrium is not diseased. The cervix is dilated to the full extent, short of rupture of the fibres, by means of metal dilators (see p. 291).

Some operators advise the employment of methods such as that of Dudley, which aim at a more permanent opening-out of the canal. In these the posterior wall of the cervix is slit up and, by doubling the two edges thus made on themselves, a persisting gaping of the canal is obtained. It is doubtful if these operations have any advantage over simple dilatation.

Acquired Acute Anteflexion

Etiology.—Here there are two different causes. (1) *Shortening of the utero-sacral ligaments* due to cellulitis, originating in a cervix torn at labour. If this spreads behind the cervix it leads to an inflammatory thickening of the ligaments. Subsequently the two ligaments become cicatricially shortened into tense bands, which drag the whole uterus backwards and upwards towards the hollow of the sacrum, *i.e.* it becomes *retroposed.* The attachment of the utero-sacral ligaments is at the isthmus, and it is here that the line of traction acts. The uterine body is held forward by the round and broad ligaments and the cervix by the vagina. The result is that the angling at the isthmus is exaggerated and the uterus finally assumes a position of retroposition plus acute anteflexion (Fig. 37).

Fig. 37.—Acquired acute anteflexion with retroposition.

(2) *Laceration and cellulitis in front of the cervix* sometimes

leads to a forcible pulling forward of the vaginal portion of the cervix, again due to a secondary cicatricial shortening. This is a rare condition.

Pathology.—Unlike the congenital type, the acquired type of acute anteflexion is associated with a parous uterus, and, moreover, the infection of the pelvis operating in these cases may be associated with an inflammatory enlargement of the uterus, and also of the tubes and ovaries. The position of the uterus is altered as described above.

Symptoms.—There may be no symptoms in a mild case. Where symptoms are present they are due as much to the chronic uterine and pelvic congestion as to the displacement.

Dysmenorrhoea and chronic *aching in the small of the back*, aggravated by exertion, are usually present. *Menorrhagia*, *leucorrhoea*, and *sterility* are common.

Signs.—On vaginal examination, in the ordinary case, the cervix is found to be drawn upwards and backwards, and it is more difficult to reach than normally. Occasionally it is directed somewhat forwards. If the fingers are passed upwards in front of the cervix and pressed deeply into the anterior fornix, they feel that the body forms an acute angle with the cervix. In the posterior fornix the two thickened utero-sacral ligaments are felt passing upwards and backwards from the uterus. On bimanual examination the abnormal position of the uterus is confirmed and the increase in its size, which is commonly present, is detected.

In the rarer form of acquired acute anteflexion the inflammatory band in the anterior fornix is felt pulling the cervix forwards.

Diagnosis.—This is easy in the presence of the above characteristic signs. Where the cervix is tilted forwards care is sometimes required to avoid an erroneous diagnosis of retroversion or retroflexion. In other cases the rounded body of the uterus felt close above the cervix may simulate a fibroid of the anterior uterine wall.

Treatment.—In the early stages the condition will be treated like all cases of pelvic cellulitis, by rest, aperients, and douching. Vaginal plugging may in the later stages be a useful adjuvant to douching. The douching and plugging are carried out systematically over a period of two or three weeks, and may, in suitable cases, result in a resolution of the cellulitis

and a spontaneous reposition of the uterus. In chronic cases the ligaments are permanently thickened and shortened and palliative measures fail to lengthen them. For these cases division of the ligaments through an incision made in the posterior fornix has been advised. The main symptoms of the condition are, however, due not to the uterine displacement so much as to the general inflammatory involvement of the cellular tissue and genital organs, and a mechanical attempt by operation to restore the uterine position is, therefore, not likely to give much benefit.

CHAPTER XII

BACKWARD DISPLACEMENTS OF UTERUS

Retroposition.—In retroposition the whole uterus is displaced backwards towards the sacral hollow. It is not a condition of great clinical importance; its occurrence is usually of incidental significance only.

The backward displacement may be due to

(1) Tumours growing in front of the uterus or from the uterus, *e.g.* fibroid. Sometimes, though not often, an ovarian cyst may lie in front of the uterus.

(2) Distension of the bladder.

(3) Inflammatory shortening of the utero-sacral ligaments or of bands binding the back of the uterus to the peritoneum on the posterior aspect of the pelvis. In the former case it may be associated with acute anteflexion, in the latter with retroversion and retroflexion.

RETROVERSION AND RETROFLEXION

Retroversion is defined as a swinging of the uterus backwards round an imaginary transverse axis passing through the isthmus. In a simple retroversion the normal anteflexion of the uterus is unimpaired (Fig. 38).

Retroflexion.—Here the body is bent backward on the cervix, so that the angle of flexion is straightened out. In the ordinary case, instead of being open forwards this angle looks backwards, and in exaggerated cases it may become acute (Figs. 39 and 40).

In the average case retroversion and retroflexion are combined, and it is unnecessary from the clinical point of view to distinguish between the two conditions.

Varieties.—It may be

(1) Congenital, or
(2) Acquired.

Congenital Retroversion and Retroflexion

Etiology.—This, like congenital acute anteflexion, is associated in many cases with imperfect development of the uterus. It is a mal-developmental condition, and the uterine position is rather a malposition than a displacement. The etiology is unknown. This type includes roughly about 10 per cent of all cases.

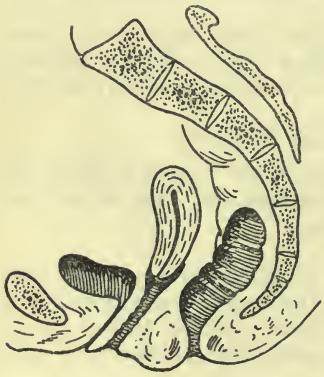


Fig. 38.—Retroversion.

Pathology.—The whole uterus is small. The cervix is conical and narrow throughout, but especially at the external and internal ora. The axis of the cervix is directed forwards. The small body which surmounts the cervix is bent backwards.

Symptoms.—The symptoms are the same as those found in congenital acute anteflexion. The two cardinal ones are: (1) dysmenorrhoea and (2) sterility.

These symptoms are due more to the narrowing of the cervix and the imperfect uterine development than to the displacement. Some cases are symptomless.

Treatment.—As in the congenital type of acute anteflexion, the occurrence of pregnancy may completely cure the pain. The uterus rises freely into the abdomen as pregnancy advances, and there is no further trouble either during or after pregnancy. The risk of the uterus becoming incarcerated in the pelvis should, however, be remembered (see p. 97).

Dilatation of the cervix may cure the dysmenorrhoea, and, in a married woman, it promotes the prospect of pregnancy. In many cases no such cure follows, and if the symptoms are

sufficiently prominent it may be necessary to replace the uterus and retain it in position by a pessary, or even by operation,

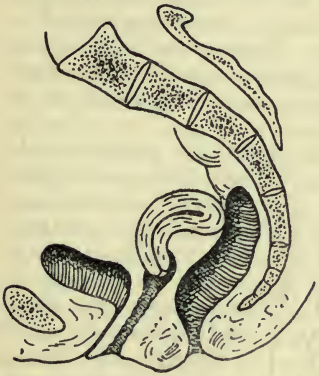


Fig. 39.—Retroflexion.

Fig. 40.—Retroversion plus retroflexion.

in a manner which will be described under the heading of the acquired retrodisplacement.

Acquired Retroversion and Retroflexion

Etiology.—(1) *The Puerperal Condition.*—This is the most important cause of retroversion and retroflexion. In it there are two main factors operating, firstly, the relaxation of the uterine supports, *i.e.* the ligaments and the pelvic floor, and, secondly, the heavy weight of the uterus. The general mode of operation of these two factors is self-evident. During the first days of the puerperium the uterine supports are stretched and lax and allow the organ to move freely within a large range. It is only with time, as a consequence of the involutionary process, that the supports shorten and stiffen. Moreover, the uterus after labour is large, and with the recumbent position of the patient it lies back against the posterior wall of the abdomen and pelvis. With the shrinkage of involution it gradually regains its normal size and position in a healthy woman.

Any factor which inhibits this normal shrinkage, for example, *sepsis*, exhaustion, or any debilitating disease, will tend to confirm the womb in a backward position (Fig. 41). This will act by preventing the healthy involution both of the uterus itself and of its supports. Infection at labour is an important cause of subinvolution and therefore of retroversion. In many cases the infective process is mild and may be undetected.

Another factor which is said to favour the production of a retroflexion in the puerperal state is distension, especially *persistent distension of the bladder.*

Fig. 41.—Subinvolution and retroflexion.

(2) *Inflammatory adhesions* in the pouch of Douglas may lead to a dragging of a uterus back as they shorten. The commonest cause of this is inflammation of the tubes and ovaries with an associated pelvic peritonitis.

(3) *Tumour in front of the uterus.*—The commonest cause here is a fibroid growing from the uterus. A fibroid tumour may induce a retrodisplacement simply by making the uterus top-heavy. Sometimes, though rarely, an ovarian tumour may lie in front of the uterus.

(4) *Strain* may, in some rare cases, lead to a sudden stretching of the ligaments and thus of itself cause a retrodisplacement. A displacement may be acquired in this way in a nulliparous patient. Exertion and straining probably play some part in the production of a retroversion and retroflexion after labour, especially if the patient sets about strenuous work too early.

(5) *Prolapse* causes retroversion, for as the uterus descends

its axis swings backwards into the axis of the pelvis, with the result that the backward displacement increases with the degree of the prolapse.

Pathology.—The *relaxation of the ligaments* and the *abnormal uterine position* are the prominent pathological changes. Retroversion and retroflexion practically always coexist. In a case that is puerperal in origin, the uterus is usually enlarged by subinvolution or congestion or both, a chronic infection often existing to complicate the condition. Under these circumstances *chronic endometritis* will be common. In such cases there may be *disease of the uterine adnexa* of a chronic inflammatory nature with retro-uterine *adhesions* which bind the body of the organ to the back pelvic wall.

Another adnexal complication of importance is *prolapse of one or both ovaries* in the pouch of Douglas. The ovary falls into the pouch as the uterus tumbles back, or it may be drawn down by the adhesions, which at the same time determine the uterine displacement.

In the ordinary case the uterus is mobile and can be replaced by manipulation. Where adhesions coexist, it is fixed in the pouch of Douglas.

Where *fibroid* or *ovarian tumours* cause the displacement their presence will dominate the pathological picture.

Retrodisplacement, we have previously stated, always accompanies prolapse of the uterus.

Symptoms.—In a simple case there may be no symptoms. It is probable that the majority of cases of retrodisplacement are without symptoms. Great care should be taken to avoid revealing to a woman the existence of such a displacement, discovered by accident in the course of an examination. The thought of a displaced womb in a nervous person is likely to induce a greater or less degree of neurasthenia. Where symptoms are present they may be due to the displacement itself or to the complications present.

Menstrual.—The menstrual function may be altered in several ways. There may be *menorrhagia* due to endometritis or pelvic congestion. There may be *dysmenorrhoea*, either premenstrual or menstrual in nature.

Pain and aching in the lower abdomen and small of the back, aggravated by exertion and helped by rest, is a marked feature. With associated tubal or ovarian mischief the pain

may be severe. In these cases it is more apt to be in the lower part of the flanks.

Leucorrhoea due to pelvic congestion or endometritis is often present. Metrorrhagia is not usual in retrodisplacement.

Dyspareunia is often a marked symptom, especially if there is ovarian prolapse. *Sterility* is common. It is due either to the abnormal position of the cervix preventing the semen from easily reaching the uterine canal, or to the uterine or adnexal disease which cripples the reproductive function. That the simple mechanical alteration in the cervical axis may be a contributory factor of importance is seen in the occasional occurrence of conception immediately after the simple reposition of the uterus and the introduction of a pessary. Many cases of prolonged sterility after the birth of a child are amenable to the simple explanation of displacement.

The presence of a retrodisplacement tends to *abortion.* On the other hand, the course of pregnancy may be little altered. After the third month the uterus grows up from the pelvis into the abdomen, the subsequent expansion undoing the original abnormal axis of the womb. Where, however, the presence of adhesions or some other factor prevents the rising of the organ out of the pelvis, *retroflexion of the gravid uterus* occurs (see p. 97).

Unless properly treated by rest and, if necessary, by the use of a pessary, a woman may have a recurrence of her displacement after the birth of the child.

Bladder.—Except in cases of retroversion of the gravid uterus, bladder symptoms are not found.

Rectum.—Pressure on this organ may sometimes cause constipation. This is probably only rarely due to the pressure of a displaced womb.

Signs and Diagnosis of Retroversion and Retroflexion.—On vaginal examination in a case of retroversion and retroflexion, the cervical axis is found to be directed downwards and forwards. The rounded uterine body may be felt on deep pressure in the posterior fornix. With a successful bimanual examination the altered uterine axis is clearly felt. The anterior segment of the pelvis is empty and, behind, the rounded body of the womb is felt, recognised by its size and shape and by its being imposed on and moving with the cervix. The body is often enlarged and top-heavy. In cases of adnexal disease, prolapse

of the ovary, or tumours of the uterus or ovary, these complicating conditions will emerge during the examination.

Whilst in the majority of cases the diagnosis is simple, a swelling in the posterior part of the pelvis, and felt through the posterior fornix, has to be distinguished sometimes from other conditions.

Swellings felt through Posterior Fornix.—These are :

(1) Body of uterus in retrodisplacement.

(2) Tumours, *e.g.* fibroid of uterus.

(3) Inflammatory distension of the tubes, *e.g.* pyosalpinx, hydrosalpinx ; adhesions surrounding the tube and ovary ; tubal pregnancy and tumours of the tube.

(4) Tumours or pregnancy of ovary.

(5) Inflammatory deposits in the pouch of Douglas, secondary to tubal or appendix mischief, tubercle, or to infection from a ruptured ulcer of the bowel, cancer, diverticulitis, etc., blood in the pouch of Douglas, *i.e.* haematocele, usually due to leakage from a tubal pregnancy.

(6) Distended rectum or pelvic colon.

(7) Lower end of enlarged kidney or spleen, or a mesenteric cyst.

In some cases, before a diagnosis can be made it may be necessary to make a careful examination under anaesthesia in order to ensure proper relaxation of the abdominal muscles.

Treatment of Acquired Retroversion and Retroflexion.—Many cases of retrodisplacement cause no trouble and require no treatment.

Mobile Retroversion and Retroflexion

Where the uterus is not fixed in its abnormal position by adhesions and treatment is necessary, it should be replaced by bimanual manipulation. To do this it may be necessary to anaesthetise the patient in order to relax the abdominal muscles. During the effort at reposition the fact that the uterus is fixed may emerge.

Manual Reposition.—The patient lies on her back with the knees drawn up and is instructed to open the mouth and breathe freely to encourage abdominal relaxation. The two fingers of the right hand are introduced into the vagina by passing the hand under the patient's right leg. Press them

deeply into the posterior fornix to lift up the uterine body. Pass one finger now in front of the cervix and tilt it back. This levers the body forward, whilst the other finger exerts pressure against the back of the body. The left hand is now laid flat on the abdomen just above the pubis, and, by deep and steady pressure, the ulnar margin is passed behind the uplifted uterine body, which is now coaxed into position by the united efforts of the internal and external hands of the manipulator (Figs. 42 and 43).

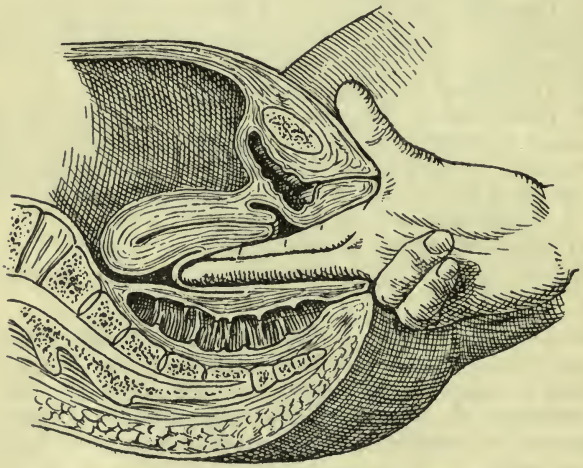


FIG. 42.—Manual reposition of retroverted uterus—first stage.

Sometimes the genupectoral position favours the easy reposition of a displaced womb. Pressure against the posterior fornix and the back of the uterus, in conjunction with the action of gravity brought into play by this position, may result in a ready replacement.

Instrumental Reposition.—If the cervix is steadied and slightly pulled on by a *volsellum* attached to the posterior lip, the uterus is sometimes brought down within easy reach of the fingers and can then be more readily replaced.

The *sound* is sometimes used for replacement, the left lateral or lithotomy position being used. Two fingers of the

left hand are passed into the vagina and laid against the posterior cervical lip, and the instrument, held in the right hand, is guided by the manipulator into the uterus. By sweeping the handle of the sound round a large half-circle forwards to the pubis, the point of the sound moves round within the uterus through a small arc. The handle is now tilted back against the perineum, the inner end of the sound

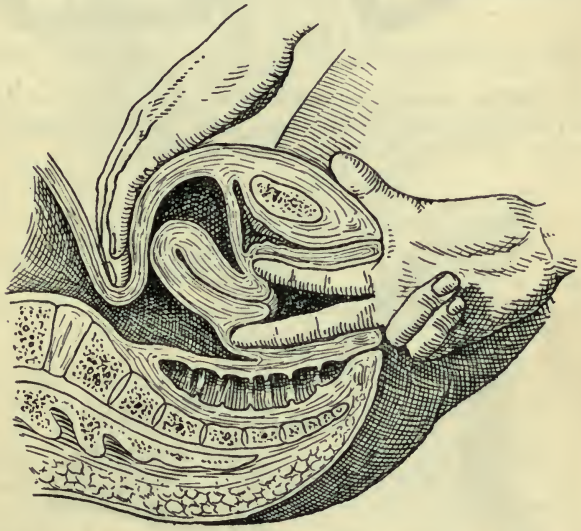


Fig. 43.—Manual reposition of retroverted uterus—second stage.

being carried forwards with the uterus. This is sometimes an easy procedure, but undue force must be avoided. It is not a method that is safe in the hand of any except those with considerable gynecological experience.

All methods necessitating the employment of instruments require careful asepsis.

Pessaries.—For the retention of a uterus in position a pessary of the Hodge or Albert Smith pattern is employed. These are made of vulcanite and can be shaped afresh by softening them for some seconds in boiling water. After being altered to the

required curve, immersion in cold water quickly stiffens them again.

The pessary consists of two bars united above and below.

Fig. 44.—Hodge pessary.

Fig. 45.—Albert Smith pessary.

In the Hodge instrument the bars are parallel, in the Albert Smith they converge below. On profile the instruments have the figure of an opened-out S (Figs. 44 and 45).

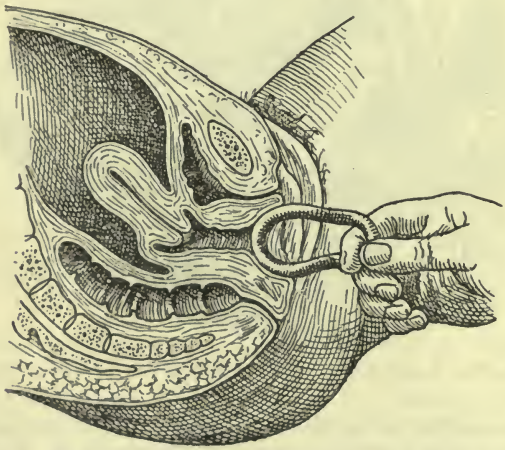


Fig. 46.—Method of introduction of pessary for retrodisplacement —first stage.

For introduction of the pessary the patient lies on her left side at the edge of the table or bed or on her back. The labia are separated with the fingers of the left hand and the instrument, held in the right hand, is inserted within the vaginal orifice with its short axis in the long axis of the opening and with the round end first (Fig. 46). In the case of the Albert

Smith instrument the broad end is inserted first. The pessary

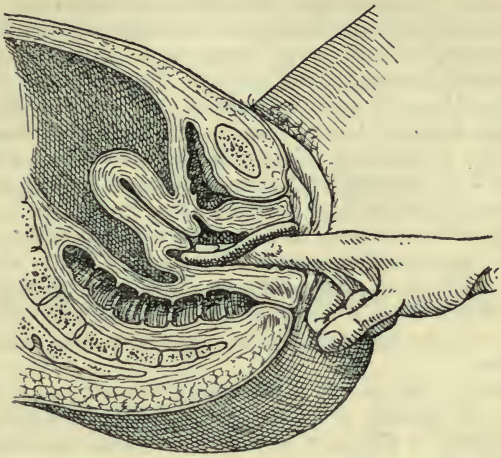


Fig. 47.—Method of introduction of pessary for retrodisplacement —second stage.

is now turned half round so that the upper convexity is directed backwards. The forefinger of the right hand is passed up behind the instrument and, placed on the upper bar, pushes it home so that the upper pole rests in the posterior fornix (Figs. 47 and 48).

The instrument in position is shown in Fig. 48. Held in by the pelvic floor below, it rests against the posterior fornix, which it supports, thus keeping the cervix tilted upwards and backwards, and as a corollary, the uterus downwards and forwards in its natural position of anteversion.

Fig. 48.—Pessary *in situ*.

Cleanliness in the use of a pessary is important. Before introduction it is cleansed and sterilised by being soaked in an antiseptic lotion. During its retention, douching with a weak antiseptic lotion, *e.g.* permanganate of potassium or lysol, should be carried out weekly. More frequent douching is inadvisable as it tends to irritate the vaginal walls, and it moreover reduces the chances of conception in cases where pregnancy is desired. The pessary, moreover, should be removed and cleansed with soap and water and an antiseptic lotion once in six weeks or two months.

If untended a pessary in the vagina soon provokes infection, and the vaginitis thus caused is associated with a foul discharge. Added to these risks are those associated with an ascending infection of the genital tract. An ulceration of the vagina may be induced and, in rare cases, this may end in carcinoma.

Failure in the use of a pessary is dependent on the facts that (1) the pessary is ill-chosen and ill-fitting, (2) the uterus is too mobile, or (3) the vaginal walls and pelvic floor are too relaxed to retain a pessary in position.

Operation.—The best operations for a case of mobile retrodisplaced uterus are (1) the Alexander-Adams operation, (2) the Gilliam or one of the modifications of the Gilliam operation. (See Chap. XXXIX.)

Fixed Retroversion and Retroflexion

Fixation is due usually to adhesions. This is the factor operating in cases associated with a chronic salpingo-oöphoritis, where the complicating inflammatory adhesions are the cause of the backward displacement.

In some cases the fixation is only apparent. Where the uterus is large and acutely bent on itself, so that it lies almost upside down in the pouch of Douglas, it may be impossible to execute reposition except under anaesthesia.

Where inflammatory adhesions prevent the replacement, a course of *douching and tamponing*, carried out over a period of three weeks or so, may mobilise the uterus so that it springs spontaneously into position or can be replaced by bimanual manipulation. Thereafter a pessary or, if necessary, an Alexander-Adams operation will hold the uterus forward.

Where loosening of the uterus is impossible, as it often is, and the symptoms are sufficiently grave, it is necessary to open the abdomen and detach the adhesions from the uterus. This is a procedure often necessary in cases complicated by adnexal disease, where the associated disease may be more responsible for the symptoms than the displacement. In these, treatment or even removal of the diseased tube and ovary on one or both sides may be required. The procedures necessary in these cases will be dealt with in a later chapter. Thereafter the uterus is swung into position by a modified Gilliam operation.

RETROFLEXION OF THE GRAVID UTERUS

Pathology.—The presence of a retrodisplacement predisposes to sterility, as we have said. If pregnancy occurs, the first months may be associated with pelvic discomfort and pain and an exaggeration of the bladder disturbance, which is common even in a normal gestation, and there is a certain risk of abortion. If the pregnancy continues, as it does in the majority of cases, the expanding uterus rises into the abdomen from the third month and natural reposition occurs. The remainder of the pregnancy progresses then without incident.

FIG. 49.—Retroflexion of the gravid uterus—early weeks.

If, however, it is prevented from rising upwards because of adhesions, a specially bulging sacral promontory, or because the flexion is marked, *incarceration* of the uterus occurs. The enlarging uterus soon comes to press tightly all round on the pelvic walls and, restrained from expanding below and laterally, any subsequent distension occurs at the expense of the upper wall. This becomes thinned out with the production of so-called *sacculation* of the uterus (Fig. 51).

When the uterus has grown to such a size that it occupies

the pelvis tightly, symptoms of pressure arise. These occur usually about the end of the third month.

Symptoms.—These are *pain* in the back and lower abdomen and a feeling of discomfort in the pelvis. Pressure on the rectum may cause *constipation*. But the dominating symptom is due to pressure on the urethra. This is due chiefly to the fact that, as the uterus expands behind and below, the cervix is driven forwards and upwards against the pubis (Fig. 50). The urethra is nipped more and more. *Difficulty in micturition passes into retention.* This, in its turn, may pass on to an incontinent dribbling from an overfull bladder.

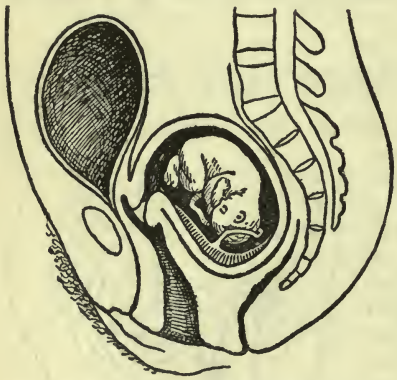


Fig. 50.—Retroflexion of the gravid uterus —about the end of third month.

The expanding bladder rises into the abdomen and in aggravated cases may form a large abdominal swelling. If associated with frequency or dribbling, the true nature of this swelling may escape detection.

With the gradual ascent of the bladder the urethra is apt to be pulled out and lengthened, a change which exaggerates the narrowing already caused by the pressure of the cervix.

In cases of severe incarceration the pressure exerted on the bladder by the uterus may cause a condition of grave ulcerative cystitis.

Diagnosis.—In an early stage of pregnancy the retrodisplaced uterus is recognised bimanually in the way described for the non-pregnant condition. The cervix is soft. The uterine body is large and soft or intermittently hard and soft as contraction and relaxation occur in sequence.

By the end of three months of pregnancy, the uterus has filled out to the extent of forming a swelling that occupies a great part of the pelvis. The rounded body, lying upside down, bulges through the posterior vaginal wall and presses down on

the pelvic floor, whilst the cervix, in its turn, is driven forward against the pubis and is lifted up farther and farther out of reach as the expansion of the uterus increases. This inaccessibility of the cervix on vaginal examination is a characteristic feature of a gravid retroflexion.

Where the bladder is distended in retention, and especially if the patient is passing urine in a manner little altered except for some frequency incidental to the overflow, the only feature that attracts attention is an *abdominal swelling out of proportion to the duration of the pregnancy.*

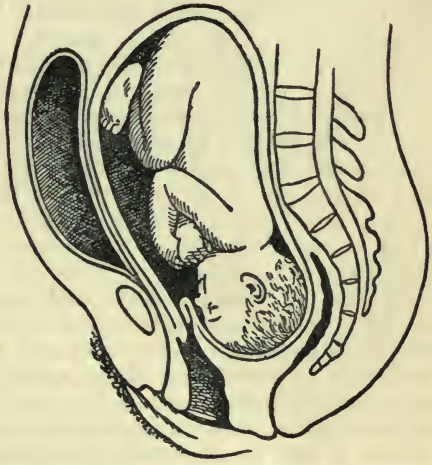


FIG. 51.—Retroflexion of the gravid uterus—later months, showing how the expansion of the uterus occurs at the expense of the anterior wall, which becomes "sacculated."

Under these circumstances the condition may be confused with (1) hydatidiform degeneration of the chorion; (2) hydramnios; (3) tumour (ovarian or fibroid) complicating pregnancy. In other cases the association of amenorrhoea with a tender swelling behind the uterus may suggest (4) tubal pregnancy.

The differential diagnosis in (1) (2) and (3) becomes at once cleared up by the passage of the catheter. The abdominal swelling subsides in the case of gravid retroversion with the emptying of the bladder, and a bimanual examination now reveals the true condition. In *hydatidiform degeneration of the chorion*, the passage of the grape-like villi during the intermittent attacks of bleeding which characterise this condition at once reveals the nature of the excessive uterine enlargement. *Hydramnios* rarely occurs so early as the third month to a degree sufficient to cause confusion. Here the uterus is

abdominal and uniformly expanded. The presence of an *ovarian or fibroid tumour complicating pregnancy* is recognised by means of a careful bimanual examination. In the one case the cystic tumour is free from the expanded uterus, in the other the hard tumour is incorporated with the uterine wall. *Tubal pregnancy* may in some cases be easily confused with retroflexion of a pregnant uterus. As a matter of fact, in the days before the possibility of pregnancy occurring in the tube was recognised, such cases were usually taken to be retroflexed pregnant uteri. In tubal gestation careful examination reveals the separateness of the uterus from the swelling. The other points of distinction will be described on a later page.

Treatment.—This consists in bimanual reposition of the uterus, the bladder having been previously emptied. Sometimes anaesthesia may be necessary in order to obtain abdominal relaxation. After reposition, a Hodge or Albert Smith pessary is introduced and left in position till the fifth month, by which time the risk of a recurrence of the displacement has passed off.

Where the uterus is fixed and reposition is impossible, the pregnancy must be terminated. For the details of the procedure required in these cases the reader is referred to a text-book on obstetrics. If the cervix is so far displaced in an upward direction that it is inaccessible for the carrying out of the routine methods of dilatation and evacuation of the uterus, it may be necessary to puncture the amniotic cavity through the posterior vaginal wall and draw off the liquor amnii. This procedure is usually followed by a speedy abortion.

CHAPTER XIII

PROLAPSE OF THE UTERUS

Definition.—Prolapse consists of a descent of the uterus in the pelvis. In association with it and causing it there are defects in the ligaments of the uterus and in the pelvic floor.

Etiology

Relaxation of the supports of the uterus (ligaments and pelvic floor) is the cause of prolapse. Without this factor descent of the womb can never occur, and with it, and in the absence of any other abnormal condition, the descent can readily occur. The common cause of deficiency of the uterine supports is the stretching and laceration incidental to pregnancy and labour. For this reason *prolapse is common in parous women and rare in nulliparae.*

It is especially apt to occur in women whose pelvic structures have been exposed to the stretching and damage of a large number of labours. One bad labour, however, may be sufficient, especially if the child has been dragged forcibly through undilated passages, with the result that the cervix and bladder are pulled down and the pelvic floor is stretched out to tearing point in front of the head. In such a case the important ligaments (utero-sacral and transverse cervical) which are attached to the cervix may be stretched beyond recovery. In addition, the fascial structures of the pelvic floor and the two levatores ani are stretched and torn apart, with the production of a permanent gap of enfeebled tissue in the middle line of the pelvic floor, through which a herniation of the viscera can readily occur. The vaginal walls remain slack after such a labour and the vaginal orifice is gaping,

especially if there has been, as there often is, a laceration of the perineum.

Intra-abdominal pressure determines the descent, and with defective supports the normal pressure may force the uterus down. The greater the pressure from above the more likely is prolapse to occur. The common combination of the two factors, repeated pregnancy and hard exertion after the births, amply explains the frequency of prolapse in the poorer classes. The straining of constipation, the coughing of bronchitis, and the downward pressure of an abdominal tumour or ascites will all tend to prolapse in women with lax supports.

Increased weight of the uterus is said to play a part in prolapse. This factor will be present in the puerperium and in uterine tumours, *e.g.* fibroid, though it is of doubtful importance. *Hypertrophy of the cervix*, which is sometimes cited as a cause of prolapse, is more probably the result, as we shall show in discussing the pathology of prolapse.

In *nulliparae* the cause of prolapse is somewhat obscure. It may occur in young girls or women or not till later years. A *sine qua non*, again, is relaxation of the uterine supports, in this case due to enfeebled health associated with poor structural tone. A sudden loss of weight, with a shrinkage of the fatty clothing of the pelvis, is said to be a possible cause. Straining, due to manual exertion, bronchitis, etc., may operate sometimes; and it is conceivable that the constant stretching of the uterine ligaments and pelvic floor in conditions accompanied by long-standing increase in abdominal pressure may finally end in rare cases in prolapse. By some, elongation of the vaginal portion of the cervix is believed to be an important cause of prolapse in nulliparae.

Pathology

The descent of the uterus is only an incident in a process of prolapse or herniation, which involves the pelvic floor and the viscera related to this, namely the uterus, bladder, and sometimes rectum.

In an early stage the vulvar outlet is gaping, the perineum is deficient, and it shows the puckered scar of a healed laceration. Sometimes, however, the perineum has not suffered any external tearing, but it is slack and toneless because of the

underlying damage of the perineal muscles, and if the two thumbs are hooked into the vaginal outlet and pulled backwards and outwards, the widely separated bellies of the levator ani can be felt.

Through the gaping orifice a large area of the anterior vaginal wall covering the bladder is seen. The damage at labour has likewise stretched this segment of the pelvic floor and loosened its bony supports. Imperfectly held up from above, and robbed of the support below, which a resilient outlet and pelvic floor provide in health, the anterior vaginal wall bulges into the vulvar opening on the least straining effort. **Cystocele,** the earliest phase of prolapse, is thus produced.

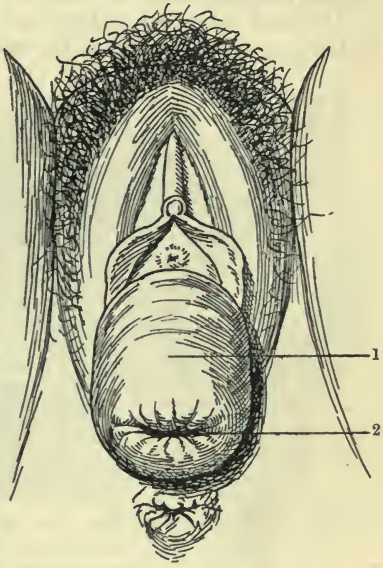


FIG. 52.—Prolapse.
1. Bladder (cystocele). 2. External os.

Once commenced, the downward descent of the anterior segment of the pelvic floor continues. The cystocele becomes greater and greater, and, as the anterior vaginal wall is forced down, it pulls on the vaginal vault. The vagina is shortened, and **descent of the cervix** and the posterior vaginal wall follows. In the end the whole vagina is turned inside out through the vulvar orifice. At the summit of the rounded protrusion, the cervical opening is seen, with, in front, the bulbous swelling of the bladder (Figs. 52, 53, and 54).

It is evident that, as the vagina and bladder are forced farther and farther out, the downward traction on the cervix tends to pull the whole uterus lower and lower. **Descent of the uterus** thus commonly occurs, and if the womb has little

to fall back on in the way of ligamentary support it is unable to resist the downward traction, and in the end, in an aggravated case, it is dragged completely outside the pelvis and is enclosed in the centre of the hernial protrusion, which bulges from the vagina. In such a case the uterus can be plainly felt behind the cystocele.

Different stages of prolapse are often described, according to the amount of descent of the uterus :

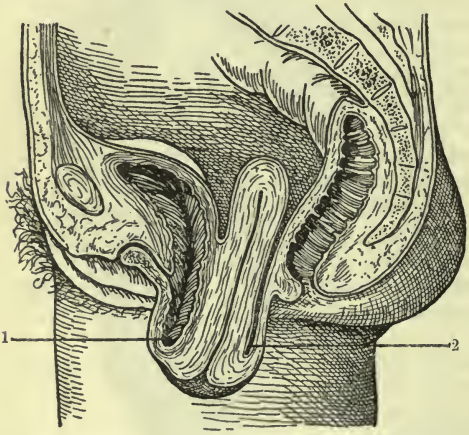


FIG. 53.—Prolapse—incomplete. Note the elongation of the supravaginal cervix.
1. Bladder. 2. Pouch of Douglas.

First, where the uterus has sunk but is still entirely within the pelvis.

Second, where the uterus is partly outside the pelvis.

Third, or Procidentia, where the uterus is entirely outside the pelvis.

It should be remembered with regard to the descent of the uterus that, in addition to the traction exerted by the emerging anterior vaginal wall, the same intra-abdominal pressure which causes the cystocele and evagination of the vagina tends, of course, to press the uterus down from above. This factor, of itself, may, in some cases, cause prolapse of the uterus without cystocele.

As the uterus descends, it swings back into a position of **retroversion,** and, following the axis of the pelvis, it becomes more and more retroverted as it descends.

In some cases the ligaments of the uterus have not been damaged during the parturient process so greatly as the structures of the pelvic floor. In cases of difficult labour the tendency is for the major damage to involve the cervix and the

floor. If any of the ligaments, round, broad, utero-sacral, or transverse cervical, retain their tone, they endeavour to hold the uterine body up at its normal level. In such a case, the body being tethered above and the cervix being dragged down from below, a stretching of the uterus in its long axis takes place. The uterus being steadied at the isthmus by the utero-sacral ligaments, the major stretching must involve the cervix between isthmus and vaginal vault; **elongation of the supravaginal cervix** thus occurs. In association with this, a certain amount of hypertrophy may take place. In some cases, however, it is a process of stretching alone.

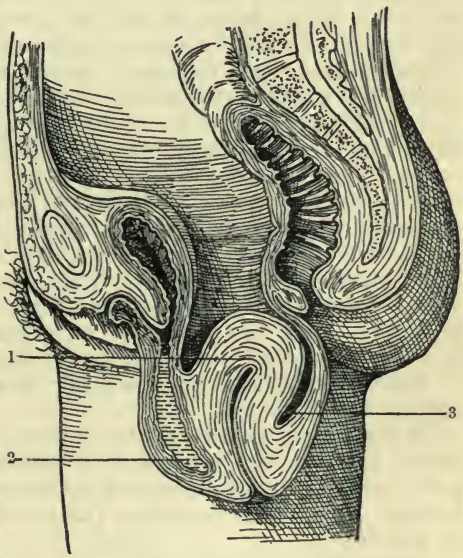


FIG. 54.—Prolapse—complete.
1. Uterus. 2. Bladder, showing pouch with residual urine. 3. Pouch of Douglas.

This change has to be distinguished from so-called **hypertrophy of the vaginal cervix** often present in cases of prolapse, and due to a chronic inflammatory thickening, secondary to the irritation and damage to which the lower end of the cervix is exposed at the vulva.

Rectocele is not uncommon in prolapse. In health the posterior vaginal wall is only loosely adherent to the rectum, and in some cases of prolapse the evagination process strips the vagina off the rectum and there is no rectocele. Where, however, the laceration of labour is followed by cicatricial changes which weld the vagina and rectum together, as the

vagina descends a pouch formed of the anterior rectal wall is pulled through the vulva, and forms the posterior compartment of the prolapse.

Rectocele may occur independently of cystocele and uterine prolapse in cases where the labour lesion has removed the support of the perineum, and where the simple straining efforts of defaecation lead to a bulging downwards and forwards of a pouch formed by the anterior rectal wall. This factor may also operate, of course, in rectocele associated with prolapse.

Complications of Prolapse.—Secondary changes in the genital and urinary areas are common in prolapse.

In the genital area the extruded vaginal walls lose the characters of mucosa and become *pale and dry like skin.* Excoriation and infection caused by contact with the clothes often induce *ulceration.* In women of dirty habits foul ulcers discharging pus often cover the prolapsed mucosa. These may persist over a number of years, and from them a chronic inflammation invades the underlying tissues and mats the organs together in *adhesions* and prevents reduction of the prolapse. It is interesting to note that, though chronic ulceration is common, cancer is rare in prolapse.

Ascending infection in such septic cases may cause *endometritis* and *salpingitis.*

In the urinary area *cystitis* is not infrequent. This may be caused by infection spreading from ulcerated surfaces. It is predisposed to by the frequent presence of a collection of *residual urine* in the dependent portion of the bladder (Figs. 53 and 54).

Hydroureter and *hydronephrosis* may be caused by a gradual stretching and narrowing of the ureteral lumen as the bladder descends. *Infection* of the kidneys may also be present.

Symptoms

In the early stage there may be no symptoms. Sometimes, on the other hand, symptoms due to the dragging on the pelvic structures are more marked in the earliest phases than they are later on.

Bearing-down pain in the small of the back is the dominating and often the only symptom. It is aggravated by exertion and relieved by rest.

"**Something coming down**" is the next most prominent complaint. The protusion, unless in the later stages and in cases swollen and adherent by ulceration, slips back when the patient lies down or she can press it back herself.

Bladder symptoms are very common. Frequency is present usually. In the later stages the patient complains of inability to empty the bladder until she presses back the prolapse into the vagina. A reference to Fig. 54 shows clearly how this occurs. If the patient strains in an effort to micturate, she closes the urethral opening. It thus happens that, in many patients, an imperfect evacuation of the bladder takes place and a residuum of urine remains in the dependent pouch. In cases associated with cystitis, dysuria and frequency will be aggravated and the urine will contain pus.

Ulceration of the exposed surfaces will be associated with a purulent, often foul, discharge.

Menorrhagia and *leucorrhoea* will be present in cases complicated by endometritis. *Sterility* is common, though the nightly slipping back of the uterus, when the patient is in bed, may allow of conception.

Prolapse of the pregnant uterus may occur, and, unless the pregnancy is ended by abortion, dangerous strangulation of the structures which project from the vulva may take place. In the ordinary case, as the uterus expands into the abdomen, the tendency to prolapse disappears, except, perhaps, of the lower part of the vaginal walls.

Signs

The signs of prolapse have become sufficiently evident from the discussion of the pathology and symptoms.

In the early stages the characteristic signs are *gaping of the vaginal outlet*, with laxity of the perineal body, and *bulging of the anterior wall*, which is aggravated if the patient is requested to strain downwards.

Vaginal examination in this stage reveals undue laxity of the outlet and partial *descent of the cervix* in the vagina, which is correspondingly shortened. Bimanually, the *fundus may be felt below the pelvic brim.*

In later stages, the large irregularly rounded and ugly *swelling found projecting* from the vulvar outlet is sufficiently

characteristic. Towards the summit of the mass the flattened cervix and external os are seen. In other cases the vaginal cervix is thickened by hypertrophy, which makes it bulge beyond the general surface of the prolapse. In front, the rounded, fluctuating boss formed by bladder is evident, whilst behind, a pouch of rectum may project.

In some cases rectocele alone, or in conjunction with cystocele, may be present.

The complicating skin-like or *ulcerating changes* in the exposed mucosa form a characteristic addition to the picture.

In the majority of cases, if it does not slip back spontaneously when the patient is recumbent, the swelling can be pressed back with ease by two fingers placed on its centre. When asked to bear down, the patient can then expel the mass afresh. Where inflammation is present, reduction of the hernial mass may be difficult or impossible.

Differential Diagnosis

In a typical case the diagnosis is patently easy, and the only point for consideration is the degree and extent of the prolapse.

It does not always happen that a patient who reports with "something coming down" is suffering from prolapse. She may have a growth at the *vulva, e.g.* a Bartholin abscess or cyst, a fibroid of the labia, a lipoma, an elephantiasis, or a malignant tumour. In other cases it is a *vaginal cyst*, which usually grows from the anterior wall of the vagina. Such a cyst may easily be mistaken for cystocele. It is, however, firmer in consistence, and the passage of a bladder sound clears away any difficulty. So it may be a *polypoidal fibroid* tumour of the uterus projecting as far down as the vulva. Here we are dealing with a solid tumour, whose pedicle may be felt where it emerges from the cervix, unless the size of the tumour prevents a vaginal examination. In such a case an abdominal examination may reveal other solid growths. Then, in submucous fibromyomata severe uterine haemorrhage is common.

Occasionally a *hypertrophic cervix*, unassociated with prolapse, may project at the vulva. Vaginal examination reveals the nature of the condition and bimanually the fundus of the uterus is felt at its normal level.

Inversion, which is a very rare condition, may simulate

prolapse. Here, however, the history is usually sufficiently distinctive and, bimanually, the uterus may be felt to be turned inside out.

Treatment

The prevention of prolapse consists in enlightened midwifery.

In the early stages, the condition may be cured by **rest** in bed, accompanied by daily douching and tamponing, in which an astringent drug, *e.g.* alum, is employed. This treatment requires trial over a period of three or four weeks.

Fig. 55.—Ring pessary.

Fig. 56.—Shelf pessary.

In the ordinary case, **pessary treatment** is the one employed. The instrument consists of a *ring pessary* (Fig. 55) made of vulcanite or of rubber held in position by a spring core, or a *shelf pessary* (Fig. 56).

Whilst the patient lies on her back, the prolapsed structures are washed clean and then replaced. The ring, compressed between the thumb and forefinger of the right hand, is introduced with its shortened diameter in the long axis of the vulvar outlet. After being inserted half way, it is allowed to recover its shape. The forefinger is pushed behind the instrument and directs its upper margin into the posterior fornix. By keeping the vaginal walls on the stretch, the ring prevents them from being evaginated. The constant stretching causes the vaginal walls to expand, and it thus happens that, in the course of time, a larger ring may be necessary.

The shelf pessary is introduced in such a way that the expanded plate is uppermost and presses against the vaginal cervix, whilst the curved rod lies with its convexity backwards, *i.e.* towards the sacral hollow.

The *cup and stem pessary* (Fig. 57) is held in by four bands, two of which pass upward in front of the thighs and two behind the thighs, to be fixed to an abdominal binder. This instrument is useful, where the ring or the shelf fails, in cases

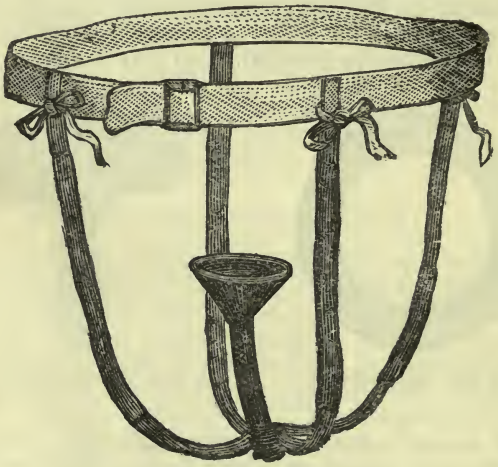


FIG. 57.—Cup and stem pessary.

associated with marked relaxation of the vaginal walls and outlet, and where there is some contraindication to operation, *e.g.* old age, cardiac or pulmonary disease.

The operative treatment of prolapse will be considered in Chapter XXXVII. The nature of the operation necessary depends on the extent of involvement of the pelvic floor. In an average case, the relaxed anterior vaginal wall is tightened up by the removal of a strip of the overstretched tissues (*anterior colporrhaphy*). A similar procedure on the posterior wall is called *posterior colporrhaphy*. The perineum and posterior segment of the pelvic floor are tightened up by a *perineorrhaphy*.

Where there is a hypertrophic elongation, *amputation of the cervix* is necessary as a preliminary step in the operation.

The question arises in many cases as to whether a plastic operation from below is sufficient to enable the pelvic floor to withstand the intra-abdominal pressure. In such cases it may be better to fix the uterus from above by means of an Alexander-Adams operation, or by some other method of *uterine suspension.*

CHAPTER XIV

INVERSION OF THE UTERUS—LATERAL AND UPWARD DISPLACEMENTS

INVERSION OF UTERUS

THIS is a rare condition. It consists of a turning of the uterus inside out. Sometimes body and cervix are inverted (*complete inversion*). Ordinarily the body is dimpled upon itself or, in a more marked stage, the body is invaginated through the cervix and its mucous aspect bulges into the vagina (*partial inversion*) (Fig. 58).

Etiology.—There are two possible causes—(1) labour, (2) tumour growth in the uterus.

Puerperal inversion occurs during the birth of the placenta, and its occurrence is a risk, if delivery of the afterbirth is attempted by traction on the cord. Or the inversion may occur immediately after the third stage is completed, if a portion of a flaccid uterus sags into the cavity. In aggravated cases of puerperal inversion, the whole womb may be turned inside out and may be projected, with the placenta still adherent to it, on to the bed between the patient's legs.

Inversion due to tumour occurs especially in the case of a submucous fibroid polypus, which is gradually extruded by the muscular contraction of the womb round it. It sometimes happens that a knuckle of uterine wall is dragged into the cavity at the point of attachment of the pedicle of the tumour. In aggravated cases complete inversion may supervene. Malignant growths of the uterus may, in very rare instances, be associated with inversion.

Pathology.—In a puerperal case, the completely inverted

uterus is gripped all round by the vaginal walls, and becomes congested and bleeds freely. Sepsis is a subsequent risk.

In a puerperal case of a milder degree, which has escaped notice at the time, irritation followed by *infection* of the mucous surface is apt to occur where it is exposed in the vagina. Extension along the tubes results in a *salpingo-oöphoritis*. Where the uterine body is completely inverted the tubes and ovaries lie crowded within the cavity of the cup formed by the invaginated uterus. Inflammation of the appendages is soon followed by adhesions within the cup, which interfere with any subsequent attempts at reposition.

Sometimes, associated with the inversion process, there is *prolapse*, in which the vaginal walls are evaginated.

Fig. 58.—Inversion of uterus.

Symptoms.—In labour inversion is accompanied by acute symptoms—*pain*, *haemorrhage*, and *shock*.

In the chronic stages a puerperal inversion is associated with *pain* in the lower abdomen and the small of the back. The congestion and infection of the uterus and the appendages result in *leucorrhoea*, *menorrhagia*, and *metrorrhagia*. *Sterility* is, of course, present.

Inversion due to tumour growths will combine the symptoms of the neoplasm, haemorrhage, etc., with the symptoms of inversion.

Signs and Diagnosis.—During labour, if the uterus is projected completely from the vagina, the signs are sufficiently obvious. A milder degree of inversion is only recognised on vaginal examination, when the rounded uterine body is felt projecting through the external os, and on bimanual examination, when the dimpling in of the uterus above is felt.

Similarly a slight degree of inversion associated with a tumour will be detected on careful bimanual examination.

The *differential diagnosis* lies between the different conditions, which are associated with a swelling projecting into the vagina : tumour of vagina or cervix, hypertrophic elongation of cervix, prolapse, submucous fibroid polypus of the uterus. A careful vaginal and bimanual examination may be necessary to clear up the diagnosis.

Treatment.—In obstetric practice the treatment consists of careful cleansing of the inverted uterus, which is then replaced under anaesthesia. The womb is packed and ergot or pituitary is given to promote normal retraction.

A puerperal inversion seen some days or weeks later may be *reduced manually*, after the congestion has been relieved by vaginal douching.

For reasons which have been given above, the reduction of an inversion, after it has existed for more than a week or two, is a matter of great difficulty. Instruments called *repositors*, manipulated by hand or fixed to an abdominal binder, are occasionally successful. In appearance these instruments resemble a cup and stem pessary (Fig. 57).

In the majority of cases, however, *operative reduction* is called for. Hysterotomy, vaginal or abdominal, is performed. The cervix is cut through, the body, thus liberated, is replaced, after which the wound in the cervix is stitched up. Hysterectomy is necessary in bad cases.

Inversion due to a fibroid polypus is treated by the *removal of the polypus*. During the operation, in such a case, it is necessary to remember the danger of cutting through the invaginated uterine wall, when the pedicle of the growth is divided. Malignant growths, of course, necessitate hysterectomy.

Lateral Displacements of the Uterus

The uterus may be displaced laterally by a tumour, *e.g.* a fibroid of the uterus, or a broad ligament tumour, or by an inflammatory exudate, which gathers on one side of the pelvis. Or the uterus may be dragged to one side by cicatricial bands formed in the parametric tissue of one side as the long-standing result of a chronic parametritis. In such a case the cervix may be drawn to one side whilst the uterine body is levered to the other side.

Upward Displacements of the Uterus

These are not of clinical importance in themselves. The uterus may be lifted into the abdomen by a *cervical fibroid* which carries the womb upwards on its back. A *broad ligament tumour*, as it expands upwards, lifts the uterus along with the appendages. Similarly a vagina distended by menstrual blood dammed back by an atresic membrane—*haematocolpos*—carries the womb upwards as it expands. In rare cases the uterus may be drawn upwards from above by *abdominal adhesions*, due, for example, to tuberculosis, which, if attached to the uterus, exert an upward traction on this organ as they become cicatricially shortened.

SECTION V

INFECTION OF THE GENITAL CANAL

CHAPTER XV

BACTERIOLOGY OF THE GENITAL CANAL IN HEALTH

In health the uterus and Fallopian tubes are sterile. This is not so, however, with the vagina. A few days after birth bacteria enter the vaginal orifice and for the rest of life the vagina possesses a bacterial flora. Amongst others, in the child, such organisms as the bacillus coli communis, staphylococcus and streptococcus are found. The conditions are probably similar to those obtaining in the healthy mouth or throat, where the infective organisms, though present, remain dormant until some lowered resistance of the tissues occurs through damage or disease, when an inflammatory process is set up.

In the adult it would seem, on the other hand, that the healthy vagina contains no pathogenic germs. Any present are probably only saprophytic. Not only so, but if streptococci or staphylococci of active virulence are introduced artificially into the vagina their virulence is found in a comparatively few hours to be strangled. They refuse to grow on culture media. Some influence exerted by the vagina has killed them. The same fate overtakes spermatozoa which lie for some hours in the vaginal cavity.

Protective Function of the Adult Vagina.—There has been some discussion as to the nature of the germicidal activity of the vagina. It constitutes a barrier to prevent the infection

of the genital canal. In health this barrier is efficient at all times, except during and after menstruation and labour.

The normal vaginal exudate is acid in reaction, and, according to most observers, this acidity is attributed to the presence in the healthy vagina of a long, thick, anaerobic and non-mobile bacillus—the **vagina bacillus of Döderlein.** It is a normal denizen of the vagina, and, by virtue of the lactic acid, which it elaborates, it protects the vagina against the incursion of hostile germs.

It is noteworthy that the vagina bacillus and the lactic acid reaction disappear during menstruation and during labour, probably as the result of the germs being washed away by the escaping fluid. At these times, as we know, a woman is especially prone to infection.

The vulvar surfaces, both mucous and skin, contain the organisms which are found on any of the exposed areas of the body, staphylococcus, streptococcus, etc. In addition, because of their proximity to the anal orifice they usually contain the germs that inhabit the bowel, especially those of the bacillus coli group.

Varying Susceptibility of the different Surfaces.—In the adult the epithelial surfaces of the canal vary in their degree of susceptibility to infection. Clinically this is especially evident in the comparatively great resistance exhibited by the vagina. In an acute gonorrhoea, for example, there may be an intense inflammation of the vulva and the cervix, whilst the vagina is little or not at all affected. It is not for some time that the bathing of the vaginal mucosa with the discharges lowers its resistance and an inflammatory reaction appears. The high natural resistance of the vagina is due partly to its structure and partly to the presence of the protective flora.

In the child, on the other hand, there is no such natural resistance and an infection may rapidly induce an acute vaginitis.

CHAPTER XVI

Bacteriology of the Genital Canal in Disease

Practically any disease germ may be responsible for inflammation in the generative organs. The commonest are streptococci, gonococci, staphylococci, and organisms of the bacillus coli group. Except in the case of the streptococci, which, especially in puerperal infections, may be alone, infection of the genital canal is usually mixed. Among the other organisms that may be found are the tubercle bacillus, bacillus tetanus, bacillus diphtheriae, diphtheroid bacilli, and the pneumococcus. Fungi and protozoa (*e.g.* trichomonas vaginalis) may occasionally be the factors responsible for infection.

Modes of Infection of the Genital Canal

Infection of the genital canal may occur in one or other of three different ways :

1. From below.
2. Spread from adjacent structures in pelvis.
3. Through blood-stream.

Infection from below.—In this, by far the most common mode of infection, the germs enter at the vaginal orifice. It is in this way that **puerperal infection** and **gonorrhoea** occur. These two main classes embrace the great bulk of infective lesions and together they form the chief cause of pelvic disease in the female. Other forms of ascending infection are **syphilis, soft chancre,** some few cases of **tubercle,** and rare cases of infection with the organisms of **specific fevers,** diphtheria, pneumonia, thrush, typhoid, etc.

Degenerating tumours of the uterus, such as submucous polypoidal fibroids and cancer, are liable to infection from below.

So, also, in **post-operative infection,** the organisms enter from below, *e.g.* after curettage, repair of the cervix.

PUERPERAL INFECTION

This is an infective process commencing during pregnancy, or during or within a few days of labour or abortion. It is, in the great majority of instances, due to a faulty technique on the part of the medical attendant or midwife, though, in a proportion of cases, it is found where every effort in the direction of clean delivery was made. That it is not necessarily due to negligence on the attendant's part is shown by its occurring in cases which end spontaneously and in which neither examination nor interference had taken place.

In the great proportion of cases, as we have said, it is preventable, and as such it constitutes one of the greatest blots in the practice of modern medicine. Whereas all other infective diseases, such as post-operative sepsis, measles, diphtheria, etc., have shown a great diminution during the last thirty years, in response to better methods of prevention and cure, the mortality from sepsis at labour still remains almost as high as ever. Even more marked, however, than the child-bed mortality are the widespread effects of milder infections, which do not kill, but which undermine the health of thousands of women for the remainder of their lives, and constitute a drain on the economic resources of a nation that is incalculable. Added to this is the crippling of the pelvic organs that dates from a labour infection and which, by sterilising the functions of reproduction, deprives thousands of women of the power of maternity.

It is impossible to exaggerate the disasters that follow child-bed infection. The immediate deaths come within the ken of the obstetrician. The ill-health and debility and sterility come within the sphere of the gynecologist and often constitute the larger bulk of his practice.

In child-bed infection the organisms are carried into the genital canal from below. They may be carried afresh into the canal during or after the birth process, or organisms, which

previously lay in the vagina dormant, may now find a nidus for their growth. They may be implanted at the beginning on the raw internal lining of the uterine cavity or they may be implanted on a laceration of the perineum, vagina, or cervix. Lacerations play an important predisposing part in puerperal infection.

Puerperal infection may be severe or mild. The severe infections manifest themselves within a few hours or days of the labour or abortion, and, in the case of a virulent organism, or in an enfeebled patient, may kill in a few days more from blood infection.

In acute puerperal infection, the **pathology** depends on the circumstances present. There may be infected tears of the perineum or vagina or cervix or a so-called puerperal endometritis with involvement of the uterine muscle. In a large number of cases the veins of the pelvis become invaded by the germs. When this occurs septicaemic invasion of the blood-stream becomes easy, or thrombi may be detached and carried as emboli to the lungs. In less severe cases thrombotic blockage of the veins of the pelvis is apt to cause phlegmasia. Extension to the pelvic cellular tissue (parametritis) is common. So, even in an acute case, the inflammation may spread rapidly upwards to the tubes and ovaries, causing acute salpingo-oöphoritis and pelvic peritonitis.

It is the results of the milder types of puerperal infection, however, that the gynecologist more commonly sees. A long-standing and deep-seated inflammation of the uterus, tubes, and ovaries may date from a labour or an abortion in which there were no signs of infection at all, or in which the only history available is that the patient had some slight fever for which she was douched.

It is mild infections in child-bed of this sort and also gonorrhoeal infection which cause the bulk of chronic infections of the generative tract and of the pelvic cellular tissue and peritoneum.

The lesions produced by child-bed infection will be described under the various local headings. They are :

Vulvitis and Vaginitis.
Cervicitis.
Endometritis and Metritis.
Salpingitis.
Oöphoritis.
Peritonitis.
Parametritis.

GONORRHOEA

This is an acute disease with chronic sequelae, which constitute a large proportion of all gynecological disease.

Etiology.—It is due to infection with the *diplococcus of Neisser*. Infection, in the great majority of cases, occurs during the sexual act. It may, in rare cases, be transmitted on a towel or by hands contaminated with a gonorrhoeal discharge, or in some other non-sexual way. Gonorrhoeal conjunctivitis is often produced in this manner, whilst, in the infant, infection of the eyes occurs commonly during the passage of the child along the birth canal.

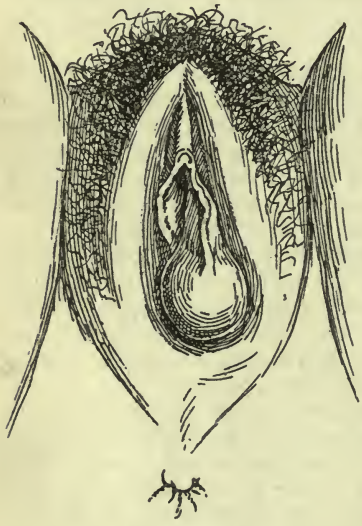


FIG. 59.—Bartholin cyst.

The disease is usually conveyed by a man suffering from an acute infection, though it may be transmitted by a sufferer in whom the disease is in the chronic phase and has become dormant in the posterior urethra.

Pathology.—In women the origins of a gonorrhoeal attack are often mild. There may be only a slight urethritis, too slight to have attracted much notice, and only elicited later with great difficulty.

Acute gonorrhoea commences usually as a *vulvitis and urethritis* due to a direct implantation of the infection on these parts from the discharging penis. It is thus more likely to be caused by a man suffering from the acute phase of the disease.

Inflammation of the Bartholin duct on each side is common in the acute stage, and oedematous occlusion of the duct is apt to be followed by an accumulation of the pent-up discharge to form a *Bartholin abscess*. This may burst externally. A

later manifestation of a blocked duct is a *cyst* of the Bartholin duct or gland (Fig. 59).

In a small proportion of cases a *cystitis*, passing on to a pyelonephritis, may develop. Infection of the bladder and kidney is rare in a gonorrhoea which is properly treated. *Proctitis* is not uncommon, being due to direct infection or derived secondarily from the vulva. Acute adenitis of the inguinal glands or *bubo*, which may pass on to suppuration, is common.

The infection may never extend beyond the vaginal aperture, where it gradually exhausts itself, though, even after the disappearance of all symptoms, the gonococci may still lurk about the Skene's tubules or in the Bartholinian glands. Or the condition may reveal itself later in the form of *venereal warts* (Fig. 60), which are usually multiple and are scattered irregularly over the labia and the inner margins of the thighs. As their name implies these warts are usually venereal in origin, though it is doubtful if they are ever due to the gonococcus. They are probably due to some organism, which is so far unrecognised.

Fig. 60.—Venereal warts.

In the bulk of cases a *vaginitis* only occurs as a late phenomenon. The mucous membrane is very resistant to the gonococcus, as to other infective germs.

Even in the acute stage the cervix may be involved. The *cervicitis* may occur simultaneously with the vulvar infection and due to the same coitus. In such cases the purulent matter is laid directly against the external os, or it escapes with the seminal emission. Cervical infection, however, may not occur till later, being carried upwards from the vulva during a subsequent coitus, or during a digital examination, or even during

douching, which is often prescribed indiscriminately and wrongly for any infective condition in the genital areas.

With infection of the cervix a gonorrhoea becomes a chronic, intractable disease. The hollows of the cervical mucosa lodge and protect the germs and make them difficult of access.

Subsequently, an extension to the corpus uteri may occur, forming an *endometritis*, and thence a spread upwards may take place to cause *salpingo-oöphoritis* and *pelvic peritonitis*. The upward reaches of the genital tract are usually involved only in a long-standing case. In some, however, just as in puerperal infection, a rapid upward spread may supervene, and an acute salpingitis and peritonitis develop whilst the disease is still recent.

Gonorrhoea shares with puerperal infection the rôle of being the most important cause of chronic inflammation of the uterus, tubes, and ovaries. The pathological changes produced in these different sites will be discussed in the chapters devoted to the regional inflammations.

Symptoms and Signs.—In a large proportion of cases, as we have seen, the initial evidences of gonorrhoea in women may be so slight as to escape notice.

Where the attack is more acute, the first symptoms usually appear about three days after the infective coitus. They are *scalding and pain at the vulva and on micturition.* The local tenderness may be so great that the patient can neither sit nor walk without severe pain. Dragging pains in the back and lower abdomen may appear as early symptoms.

On inspection, the vulvar surfaces are reddened, sodden, and bathed in a *sero-purulent exudate*, which tends to glue the labia together. The *urethral opening* is angry, and the mucosa pouts in the form of a red, tender and swollen cuff. From it a drop of yellow pus can be seen trickling, or it can be squeezed out by a little massage of the urethra from above downwards.

The *Bartholin ducts* on each side of the hymen stand out as red spots. The tripartite phenomenon—acute congestion of urethra and Bartholin ducts—is suggestive in itself of gonorrhoea, though it may be present in any acute inflammation of the vulva. A *Bartholin abscess* bulges through the labium minus and labium majus, forming an acutely tender swelling at the postero-lateral aspect of the vaginal opening. The condition may be bilateral. If left to itself it may rupture.

The presence of an innocent swelling in the same site at a later stage of the disease denotes a *Bartholin cyst.*

The symptoms and signs of such conditions as *proctitis, cystitis, bubo,* and *venereal warts* do not require special description.

Cervicitis in the acute stage gives rise to *dragging pains in the back* and to a *purulent leucorrhoea.* If examined through a speculum, the vaginal portion of the cervix is seen to be swollen, the external os is patent and it is surrounded by an area of inflamed mucosa, and pus may be seen emerging from the os.

In chronic cervicitis the most characteristic appearance is the bright red granular patch of "*erosion*" that encircles the external os. This condition is associated with a chronic intractable leucorrhoea. Endometritis, when present, contributes to the leucorrhoeal discharge, and it is an important cause of the *menorrhagia* and *sterility* that characterise a case of chronic gonorrhoeal infection. These are also partly due to the infection of the tubes and ovaries.

The symptoms and signs of gonorrhoeal salpingitis and oöphoritis are discussed in Chapter XX.

Diagnosis of Gonorrhoea.—The symptoms of an acute gonorrhoea are so characteristic that they can hardly be confused with any other condition. Pain and scalding of the vulva with acute tenderness on micturition, accompanied by a purulent discharge, all coming on some days after coitus, are clinically almost certain evidence of gonorrhoea.

Complete demonstration of the disease can only be made by the discovery of the gonococcus, and in slight cases this is often the only means of clearing up a doubtful diagnosis. The best site for obtaining the discharge for bacteriological examination is the urethra. Here the infection is less likely to be contaminated with other germs. Mixed infection is a common sequel in other sites, and sometimes in the cervix or tubes the growth of the bacillus coli or the pyogenic organisms may completely strangle the original gonococcal infection.

To procure Pus from Urethra.—After separating the labia and washing the vulva and the urethral orifice to remove any surface infection, the urethra is firmly stroked from behind forwards and the pus expressed is transferred to a glass slide. As a routine method it is better to rely on a stained film than on a culture. Cultural methods are very uncertain in gonor-

rhoea. In preparing the film a useful hint is to dab the pus on the slide. This protects the white blood corpuscles better than the making of a smear, and the intra-cellular relationships of the organisms are more readily recognised. For the details of staining, the student is referred to a text-book on bacteriology.

To procure pus from the cervix the patient should be under an anaesthetic in the lithotomy position. A posterior speculum is placed in the vagina and the cervix is carefully drawn down with a volsellum. The area surrounding the external os is cleansed, and to remove the mucus a swab soaked in a weak solution of caustic soda is useful. The sterile swab is now pushed deeply into the cervix and rubbed round the canal. The purulent matter is then transferred at once to a glass slide as described above.

In long-standing cases of gonorrhoea the gonococcus is often difficult to find and many examinations may be required. In some cases, which are undoubtedly gonococcal in origin, the mixed infection with bacillus coli, staphylococcus or streptococcus may completely kill out the germs of original infection. In these cases during the remainder of the disease the secondary germs alone are discoverable. The gonococcus is not present.

A clinical fact of importance is that sometimes the gonococcus can be obtained more readily from the cervix after menstruation.

Treatment of Gonorrhoea.—During the acute phase, rest in bed with light diet and the administration of a brisk purge are indicated. For the acute pain and dysuria the patient should use frequent hot sitz baths or she should have the parts bathed with some mild antiseptic lotion. At the beginning, the tenderness may be so acute that the patient can tolerate nothing in the shape of handling. The douche should for this reason be allowed to trickle over the parts as she lies on a bidet.

The urethritis is treated with irrigations given by means of a douche-can, tube and nozzle. An acorn-tipped nozzle should be used, by means of which the flow along the urethra is directed from before backwards. When the flow is turned on, the nozzle is pushed further and further in, till the posterior urethra is irrigated. The head of water used should not

exceed 3 or 4 feet. The best all-round lotion for irrigating purposes is 1 in 8000 permanganate of potash. As alkalies are inimical to the gonococcus, sodium carbonate in the strength of ·75 per cent may be advantageously used, as advised by Harrison. 1 to 2 per cent protargol is also a useful lotion.

For inflammation of the Bartholinian gland, the best treatment is incision and drainage. A cyst should be shelled out entire.

Inguinal adenitis, before suppuration, is treated by rest and hot applications. If pus forms it should be evacuated by incision.

Proctitis is treated by frequent douching with permanganate solution.

For vaginitis, douching with a solution of permanganate of potassium, 1 in 8000, should be employed.

For cervicitis the patient is anaesthetised, the uterus is drawn down with a volsellum, and the mucous membrane lining the cervical canal is removed with a sharp curette, after which the surface is swabbed with some strong caustic, such as pure phenol. This method has the advantage of removing the tissues in which the gonococci are lodged, and it may completely cure the condition. No method is completely assured of success, but a radical measure of this sort is worthy of trial. The application of iodine or other antiseptics to the vaginal surface of the cervix, and the swabbing out of the cervical canal, are sometimes of temporary use in the acute stages.

The treatment of the more chronic sequelae of gonorrhoea as it affects the cervix and the uterine body, as also gonorrhoeal disease of the uterine appendages and the pelvic peritoneum, will be described under the headings devoted to the regional diseases (Chapters XIX. and XX.).

Gonorrhoea in Young Girls

This usually takes the form of a vulvitis spreading to the vagina, which is more prone to infection in children than in adults. Extragenital gonorrhoea in the conjunctiva is not uncommon in young children.

Vulvitis may be produced by infection during rape, or the child may be infected by the use of contaminated towels.

In institutions, gonorrhoea may spread as a pest carried by infected towels or thermometers.

The symptoms and signs of vulvo-vaginitis in children are similar to those found in the adult.

The treatment follows the same general lines. The vulvitis is treated by lavage of the parts three or four times a day with permanganate of potassium solution, and the antiseptic action is kept up by placing a pad soaked in 2 per cent protargol between the labia.

Infection from Adjacent Structures.—The genital canal may be infected from the **bladder,** either *via* the vulvar orifice or by a direct extension in cases of acute cystitis or in malignant disease. So an inflammatory spread may occur from some part of the **bowel** in such conditions as diverticulitis or malignant disease of the sigmoid or rectum. In the latter case an inflammatory extension will often precede the invasion of the cancer elements.

The commonest source of infection of the genital organs from the bowel is through the **appendix.** An inflamed appendix, especially if it dangles over the pelvic brim, usually becomes adherent to the right tube and ovary, inducing an acute or chronic salpingo-oöphoritis, the degree and severity of the genital infection being determined by the state of the appendix. An inflammation grafted on the tube in this way may spread downward and involve the uterus.

CHAPTER XVII

INFECTION OF THE GENITAL CANAL THROUGH THE BLOOD-STREAM

EXCEPT in the case of **tuberculosis,** infection of the generative organs through the blood-stream is rare and clinically unimportant. Metastatic infection of the uterus, tubes, or ovaries may occur in the **specific fevers,** measles, scarlet, pneumonia, typhoid, etc. So, in mumps, an inflammation of the ovary may occur as a secondary phenomenon similar to the involvement of the testicle that occurs in male patients. In **septicaemia** and pyaemia foci of infection may be deposited in the genital organs.

TUBERCULOSIS OF GENITAL TRACT

Clinically this is the most important blood infection of the generative area.

Pathology.—In rare cases tubercle may occur in the form of an *ascending infection.* The vulva may be involved in cases of phthisis or in infection derived from the urinary tract, or, in the child, the infection may come from tuberculous parents. It is possible that, in rare cases, tuberculous disease may be transmitted to a woman in the semen of her husband. In ways similar to the above the vagina and cervix may be directly infected with the bacilli of tuberculosis and, once established, an ascending spread to uterus and tubes and ovaries may supervene.

This ascending mode of invasion is rare. Of commoner occurrence is a *spread from adjacent structures.* Thus, in tuberculosis of the peritoneum or mesenteric glands, an extension to

the pelvic organs may take place by a direct surface spread or by an extension along the lymphatics.

The prevailing origin of a genital tuberculosis is a blood-stream infection. The primary source is a lesion in the lungs, bronchial glands, mesenteric glands, etc.

In **diffuse miliary tuberculosis** the pelvic peritoneum and the genital organs may be riddled with the minute tubercles. The secondary involvement of these organs has no clinical significance in such a condition, where the generalised spread of the disease soon ends in death. These cases, for obvious reasons, only rarely come within the ken of the gynecologist.

The type of pelvic tuberculosis in the female that is of greatest clinical importance is a chronic disease. It com-

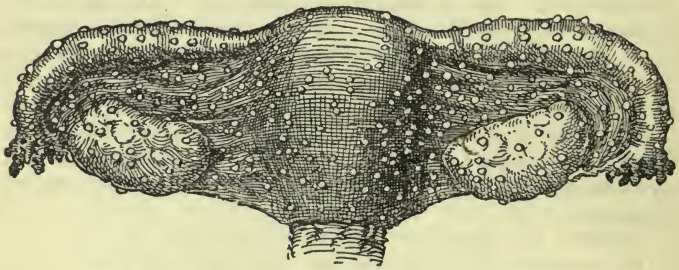


FIG. 61.—Tuberculous disease of the pelvic organs.

mences as a **bilateral tuberculous salpingitis.** The foci may originate as scattered tubercles on the peritoneal surface of the tubes, thence spreading to the interior, or they may first involve the muscular wall or mucous membrane (Fig. 61).

For a considerable time the disease may remain confined to the tubes, which undergo a progressive distension to form a condition of bilateral **tuberculous pyosalpinx.** Here the tubes are thickened and distended with caseous material. They are usually small, but may form large semi-solid swellings filling the pelvis and rising into the abdomen (Fig. 63).

In a long-standing case the disease may spread from the tubes to the pelvic peritoneum and the ovaries, and there is formed in the pelvis a mass of dense adhesions in which the uterus, tubes, and ovaries are incorporated, and in which the individual organs may be difficult to recognise either by

FIG. 62.—Tubercular Endometritis.

bimanual examination or even after the abdomen is opened. This is the **adhesive type of pelvic tuberculosis.** The adhesions to bowel in the course of time tend to shorten and may produce bands that cause obstruction.

Not infrequently in the course of its development the disease is characterised by the accumulation of ascitic fluid in the abdominal cavity. This is the **ascitic type**, and, like the preceding type, it is sooner or later associated with a more generalised abdominal tuberculosis. In some cases, of course, the pelvic disease is from the beginning dependent on a spread from the abdominal cavity.

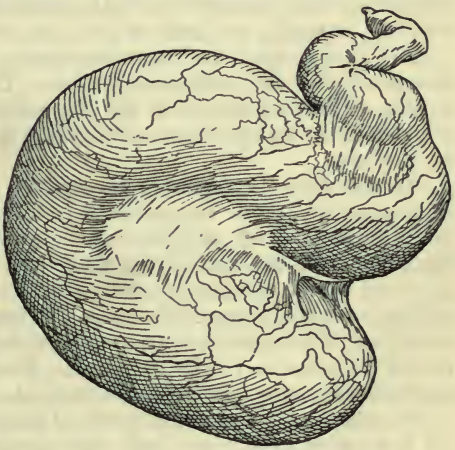


Fig. 63.—Tuberculous pyosalpinx.

Not infrequently the fluid or caseating matter, that characterises the tuberculous process, becomes locked up in compartments bounded by adhesions. Under these circumstances localised cystic or semi-solid swellings may be formed in the pelvis or lower abdomen simulating cystic or solid tumours. Many such cases are easily confused with an ovarian cyst or a fibroid tumour.

The disease may spread down to the uterus, producing a **tuberculous endometritis** (Fig. 62). Later the cervix and vagina and vulva may be involved. These latter sites are only rarely affected.

In connection with tubercle the well-known tendency to mixed infection should be remembered. The infection may occur from below or it may be due to a spread from bowel. Its occurrence is soon revealed by the development of acute symptoms associated with pus formation.

Symptoms and Signs.—Tuberculosis in the pelvis, if occurring in association with phthisis or general abdominal tuberculosis, may be masked by the symptoms due to the more prominent lesion. In many cases, on the other hand, the pelvic disease may dominate the clinical picture from the beginning. There may be no evident sign of tubercle elsewhere.

It may be found at any age, though it is characteristically seen in young women and girls. Its development may be insidious, being associated with such vague symptoms as debility, **anaemia,** and **pain** in the back and lower abdomen.

The pain may be intermenstrual. It is apt to be exaggerated at the menstrual periods. There may be **menorrhagia.** This may be due to the general pelvic congestion. If dependent on an infection of the uterus it is associated with a **leucorrhoea.**

As the disease progresses there may be **diarrhoea** due to irritation or actual involvement of the bowel. **Pain on micturition** is often a prominent symptom. The **abdomen becomes distended** by ascitic fluid or by the formation of localised swellings due to distended tubes or to irregular areas of fluid or caseous accumulation. The **temperature** swings up at night. The nights are accompanied by perspiration. The health becomes seriously impaired. The loss of weight and anaemia become more and more marked.

Sometimes in a case, apparently of long standing, there may be few or no symptoms until the occurrence of acute pain due to obstruction of the bowel by adhesions or to a sudden increase in the local inflammation in the pelvis or abdomen.

Diagnosis.—A pelvic swelling behind the uterus in a woman suffering from phthisis or advanced tuberculosis is presumably formed of tuberculous tubes. Where there are no such guiding indications, swollen tubes or a localised solid or cystic mass in the pelvis due to tubercle may be difficult to diagnose from **other forms of salpingitis** or **ovarian tumour.** Their occurrence in a young woman suffering from anaemia and debility would rouse in one's mind the suspicion of tubercle. A solid or cystic mass in the ovarian region or regions associated with an ascites has to be distinguished from a malignant or papillomatous tumour of the ovary.

Menorrhagia and leucorrhoea due to tuberculous endo-

metritis can only be diagnosed after curettage and microscopic examination of the scrapings removed.

A tuberculous infection of the cervix has to be distinguished from **cancer, sarcoma,** and **gumma.** The diagnosis is cleared up by microscopic examination.

Treatment.—In a doubtful case, **palliative and tonic** treatment should be adopted till the diagnosis becomes clear. Often in a case of phthisis or generalised abdominal tubercle no other mode of treatment is at any time possible. Sanatorium and tuberculin treatment will be resorted to in such cases.

When a localised pelvic tuberculosis is definitely diagnosed, the abdomen should be opened and the **infected tubes and ovaries and uterus removed.** If it is possible to conserve a piece of ovarian tissue in the case of a young woman, this should be done.

Where the structures are deeply involved and the organs are inextricably embedded in adhesions, no operative removal should be attempted. In rare cases, especially if the condition is associated with tuberculous ascites, the mere opening of the abdomen may be followed by a happy result.

Endometritis is usually if not always secondary to tubal infection, and curettage or even hysterectomy without a concomitant removal of the tubes is futile.

There are some cases of infection of the cervix in which the disease is limited and apparently due to infection from below. These cases have sometimes been successfully treated by amputation of the cervix.

CHAPTER XVIII

INFLAMMATION OF THE VULVA

Etiology

Venereal Disease.—The most common causes of vulvitis are venereal. They are gonorrhoea, soft chancre, and syphilis.

Fig. 64.—Venereal warts.

Gonorrhoea.—The symptoms, signs, and treatment of gonorrhoeal vulvitis have been described in Chapter XVI., to which the reader is referred. *Warty* growths on the labia, mons, and inner sides of the thighs often follow gonorrhoea, and develop some time after the original infection. They are caused, not by the gonococcus, but by some other virus, which has so far escaped recognition (Fig. 64).

Soft Chancre.—This is an acute infection, characterised by a number of small ulcers with elevated, well-defined edges present on the labia or clitoris. They are commonly associated with inguinal buboes.

Syphilis.—The primary sore is usually single, though in

women there is a greater tendency to multiplicity than in men. In this case the distribution may be symmetrical. The commonest sites are the clitoris, and the labia minora or majora. In the female the basal induration so characteristic of the primary chancre in the male may be absent or only slightly evident.

Local conditions, such as filth, are a frequent factor in the poorer classes. In fat women the opposed surfaces of the labia or the surrounding skin may be the seat of intertrigo. So damage during coitus, rape, or labour may cause a vulvitis. In rare cases diphtheria and thrush may occur on the vulva and vagina. In a child *noma vulvae* may complicate an exanthematous fever. This is a rapidly spreading inflammation associated with early necrosis, and is very fatal. It requires to be treated by wide excision.

Irritating fluids, which trickle over the vulva, are a common cause of inflammation. Such are infected or diabetic urine, and discharges from the cervix or uterus.

Tuberculosis of the vulva is similar to tuberculous infection of the skin in other parts of the body. It may be ulcerative, in which the typical undermined, chronic ulcer covered with slimy granulations is present, or it may be associated with proliferative changes.

It has to be distinguished from syphilis, elephantiasis, esthiomène, and from cancer. Microscopic examination is often necessary before a diagnosis can be made.

Treatment

The treatment of vulvitis depends on the condition present. The removal of the cause, where this is possible—*e.g.* cystitis, degenerating tumours of the uterus, filth, etc.—will cure the inflammatory process. The treatment of gonorrhoea is discussed in Chapter XVI. In tuberculosis tonic treatment with the application of local measures, such as X-rays or radium, may be successful. In other cases excision is necessary.

The following conditions have an obscure etiology, but they are usually included under the heading of vulvitis :

Leukoplakia Vulvae.
Kraurosis Vulvae.
Elephantiasis Vulvae.
Esthiomène.
Eczema Vulvae.

Leukoplakia Vulvae

This is found as a rule in women towards the menopause. The surface covering of the labia and the adjacent areas of the thigh and perineum acquire a dull white colour.

Etiology.—The condition is inflammatory in origin, and commences as an acute or subacute process, which passes over into the chronic stage, in which it is usually first recognised.

Pathology.—The early stages show swelling of the tissues and hyperaemia of the vessels with a proliferation of the dermic epithelium. In the later stage there is a fibrosis in the subepithelial tissues and thinning of the epithelium. In this stage atrophy and flattening out of the vulvar structures may occur. Cracking and ulceration of the surface may develop and the chronic inflammatory process may pass into *epitheliomatous ulceration.*

Symptoms and Signs.—Pruritus in the early stages and pain in the later stages are characteristic. The whitish plaques or the general dull white coloration of the vulva and thigh in the later stages reveal the condition at once to visual examination. The vestibule is usually not affected.

Treatment.—For the irritation of the first stage, strict cleanliness and a hot alkaline hip-bath before bed are useful. Sedative ointments, such as menthol (5 per cent) or cocaine (5 per cent), may be used. In the later stages, if these measures fail, and especially if intractable ulceration develops, a free excision of the affected skin area is necessary, including an extirpation of the inguinal glands.

Kraurosis Vulvae

This is a comparatively rare condition, which occurs typically in women about the time of the menopause. It may occur in young women after double oöphorectomy.

Pathology.—It is a slowly developing atrophic process. To

begin with there may be scattered areas of a reddish colour on the vestibule and labia minora. Not infrequently such an area may be present on the urethral orifice, simulating a caruncle. The later stages are characterised by a glistening surface of a peculiar yellowish hue and a shrinkage of the vestibule, labia minora, and clitoris. Complete atrophy of these areas may take place, and this is usually combined with a shrinkage of the vaginal orifice.

Symptoms and Signs.—Pain and aching in the vulva are often present. Dysuria is common. Dyspareunia is usually present. In time coitus becomes impossible for mechanical reasons, and this is often the chief symptom.

The signs are given under the heading of Pathology.

Treatment.—Cleanliness, with the nightly use of the alkaline hip-bath, is indicated. Sedative lotions or menthol (5 per cent) or cocaine (5 per cent) ointment may be of service. In the early stages the localised areas of hyperaemia and sensitiveness should be cauterised. In the later stages a plastic operation for the expansion of the vulvar orifice is sometimes required.

Elephantiasis Vulvae

This is rare in this country. It is commoner in the races of tropical countries or in white women who have lived in these countries. It is caused by a blockage of the lymphatics of the vulva by the worm or ova of *Filaria sanguinis hominis*. It is associated with a nodular or warty growth of the labia which may develop to an enormous size. Sometimes it is said to occur independently of a filarial origin.

Esthiomène

This term is applied to a chronic ulcerative process of the vulva associated with induration and hypertrophy. The chief causal factors are filth, irritation, and perhaps some specific infection, such as tuberculosis, syphilis, and gonorrhoea. It occurs especially in prostitutes.

Eczema Vulvae

This is a chronic inflammatory process, papular in the beginning, and then becoming vesicular and weeping. Dry

crusts and scales form in the later stages. It may be due to local irritation of the vulva or it may be caused by irritating vaginal discharges.

INFLAMMATION OF THE VAGINA

Vaginitis is a comparatively rare condition, and, where found, it is usually in combination with a long-standing infective condition of vulva or uterus. It may occur as an early phenomenon of infection in children, in whom a vulvo-vaginitis is common in gonorrhoea.

The relative infrequency of vaginitis is dependent chiefly on the resistance to infection offered by the glandless squamous epithelium, which lines the canal, and partly, probably, to the natural protection against germ infection, which the vagina possesses in the shape of its germicidal flora and acid secretion. In children the tender epithelium is less resistant.

Etiology.—Vaginitis may be caused by a direct *infection* such as occurs in gonorrhoea, soft chancre, or during labour. In the latter case a *laceration* of the vaginal wall is a common mode of entrance for germs. This avenue constitutes an important factor in many cases of puerperal fever. Infection may occur also during or after *operations* on the vagina itself or cervix or perineum. A secondary spread of infection to the pelvic cellular tissue causing parametritis is common in vaginitis due to laceration.

An *untended pessary* and urinary and rectal *fistulae* are usually accompanied by vaginitis. So also a necrotic *tumour*, such as fibroid or cancer, in the vaginal canal. Infective discharges from the uterus trickling over the vagina will cause an inflammatory process.

Occasionally the infection is due to the organisms of *diphtheria* or *pneumonia*. In the child *thrush* may infect the vagina. In tropical countries, especially, vaginitis may be due to the presence of protozoa, the best known of these being the *Trichomonas vaginalis*, an animalcula which is provided with a cluster of flagella. It is only to be recognised in the fresh wet discharge.

Symptoms and Signs.—Pain and scalding at the vulva, dysuria, and dyspareunia are present. A leucorrhoeal or purulent discharge is complained of. On examination the

vagina is seen to be reddened and bathed in secretion and it is tender to the touch. Microscopic examination of the secretion may reveal the infecting germ.

Treatment.—Rest in bed with hot applications to the vulva may help. An effort is made to discover and remove the cause. Vaginal douching with weak antiseptic lotion may be cautiously employed. If gentle irrigation with a low head of lotion is used, no damage can be done. Indiscriminate and forcible and too frequent douching may do more harm than good by irritating the vaginal walls and aggravating the inflammatory process or by squeezing the infection upwards into the uterus or even the tubes. Except in the acute stages, a tampon made of pledgets of wool soaked in 10 per cent ichthyol in glycerine is useful. The tampon should be sufficiently large to distend the vaginal walls, and thus bring the antiseptic in complete contact with the infected surfaces.

CHAPTER XIX

INFLAMMATION OF THE UTERUS

INFLAMMATIONS of the uterus constitute a large and important class of gynecological disorders. It is convenient to consider them as under:

1. Inflammation of the Cervix.
2. Inflammation of the Body.
   (*a*) Endometritis.
   (*b*) Metritis.

GENERAL ETIOLOGY

Infection of the uterus may be derived from the blood-stream, or it may spread from above or from below.

Blood-stream infection is uncommon and is rarely of clinical import. It occurs in such conditions as the specific fevers, scarlet, diphtheria, typhoid, etc., in the rare cases in which tubercle has its first pelvic nidus in the uterus, and in the multiple pus foci of pyaemia.

Infection from above occurs either by a spread from the tube or tubes, which are infected from the appendix or other part of the bowel, or by a direct spread of infection through the uterine wall from bowel. The most common type of this descending infection is tuberculosis, which commences in the tubes and thence spreads to the uterus.

Infection from below is by far the most important avenue. It comprises *infection at labour* and **gonorrhoea,** which, between them, embrace the majority of uterine infections.

In **puerperal infection,** which occurs after abortion or labour, the causal factors may be many. These are discussed fully in

obstetric text-books and in Chapter XVI., and can only receive mention here. Faulty management is the common cause. This introduces the germs, which find a ready soil in the raw inner uterine surface and in the blood discharges of the early puerperium. The retention of placental tissue, improper retraction due to inertia uteri, laceration of the cervix, and the debility after haemorrhage all may operate individually or in combination. The streptococcus alone, or in conjunction with bacillus coli communis, is the common infecting germ.

Post-operative inflammation, and inflammation engrafted on degenerating **tumours,** cancers, and fibroids, are also derived from below. In some rare cases, the organisms of the **specific fevers,** typhoid, pneumonia, diphtheria, etc., may reach the uterus from below.

Infection of the cervix from below may occur in **soft chancre, syphilis,** and, rarely, in **tubercles.**

INFLAMMATION OF THE CERVIX

The cervix is particularly prone to ascending infections because of its exposure in the vagina, where it becomes a ready receptacle for the gonococcus injected with the semen, and because it is exposed to the common risk of laceration during labour. The crypts and lacunae of the mucous membrane of the canal of the cervix afford a safe shelter for organisms, and in these gonococci may lie dormant for long periods after the acute attack has passed.

Pathology

In **acute** cases the cervix is swollen and congested and a purulent exudate covers the outer or vaginal surface and leaks from the canal. Microscopically, the mucous and fibro-muscular strata are seen to be hyperaemic and oedematous, and the tissue is infiltrated with round cells. The causal germ may be recognised by special staining methods. After labour these changes may be focussed round a laceration.

Infection of a wound produced by labour or operation may result in extension along the lymphatic and connective tissue spaces of the parametrium. Pelvic infection, thus induced,

may assume acute and grave characters, or it may remain as a chronic process, resulting in cicatricial contraction and long-standing pelvic discomfort.

In **chronic** cases the cervix is often greatly enlarged, due partly to the oedematous swelling, and partly to the excessive fibrous tissue, which is laid down. A similar enlargement of the cervix often accompanies prolapse of the uterus where it is caused by the chronic irritation of exposure and friction. This chronic inflammatory enlargement is usually specially marked in the vaginal portion of the cervix. It is sometimes called hypertrophy, but it has to be distinguished from the condition of true cervical hypertrophy, which is occasionally seen, and which may be congenital.

Proliferative changes in the mucosa of the canal are common. There may be an adenoma-like overgrowth of the glandular elements associated with a thickening of the mucosa. This may be accompanied with localised projections of mucosa into the cervix to form **mucous polypi.**

Chronic inflammation of the cervix is commonly associated with " erosion " and with the formation of Nabothian follicles.

Erosion of the Cervix.—This may take the form of a localised area on the vaginal surface of the cervix to one side of the os. More usually the area encircles the os as an annular patch of deeply congested mucous membrane. The affected surface is granular in appearance and roughened, and to the naked eye the conditions suggest an ulcerating or eroded surface. This explains the term " erosion " given by the older gynecologists. Even to the naked eye it has the look of an inflammatory process, and the surface is covered usually with a viscid mucus or a muco-purulent material.

This condition has to be distinguished from ectropion of the cervix, where, after bilateral laceration, the two cervical lips flare apart, exposing the mucosa of the cervical canal. This is normally rugose and reddish and may closely simulate " erosion."

Microscopically a piece of tissue cut from the surface of an erosion shows hyperaemia and round-celled infiltration, and there are scattered areas of desquamation of the stratified epithelium (Fig. 65). The characteristic change, however, consists in the appearance under the squamous epithelium of

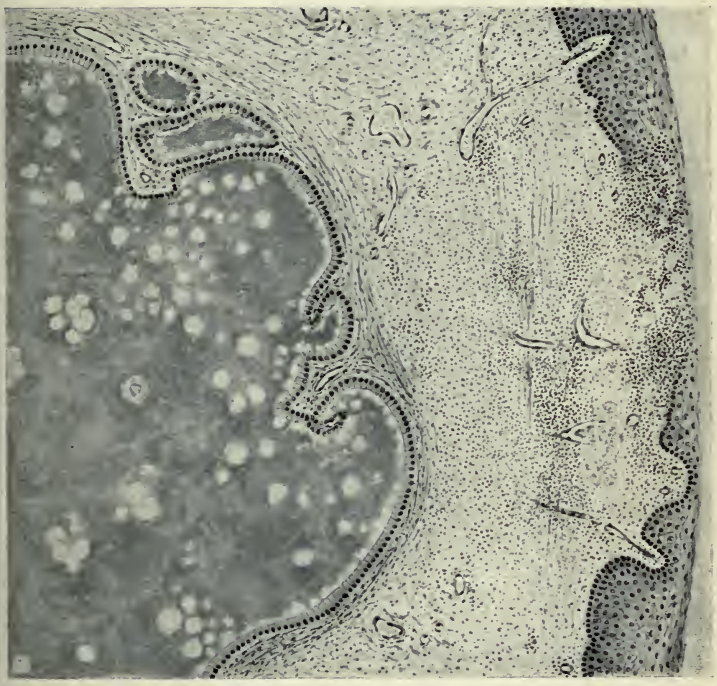


FIG. 65.—Section of Cervix showing on the right a patch of "Erosion" of the squamous epithelium, and on the left a Nabothian Follicle.

numbers of irregular gland spaces lined by a tall thin epithelium of the kind that forms the glands of the canal of the cervix. As a matter of fact, it seems that, in association with the chronic inflammatory process, there occurs a proliferative change in the cervical glands, which spread beyond their usual boundaries and plunge right down against the squamous covering of the vaginal aspect of the cervix. These down-growing gland tubules may project into the spaces where desquamation has occurred and may actually come to open on the vaginal aspect of the cervix.

Nabothian Follicles are an evidence of chronic inflammation of the cervix and frequently accompany erosion. They are small tense cysts about the size of a pea which bulge by a glistening surface on the vaginal aspect of the cervix. They are filled with a viscid mucus and are lined by a columnar epithelium (Fig. 65). In the larger cysts the epithelium may be flattened. They originate from glands of the cervix, whose mouths have been occluded by the fibrous contraction of the chronic inflammation. They are thus retention cysts which have expanded towards the vaginal aspect. In some cases they become polypoidal and hang into the vagina by a narrow neck.

They have to be distinguished from carcinoma. They may simulate the hard nodular condition of an early localised carcinoma, but the diagnosis clears up at once if they are pricked with the knife, when the viscid contents can be expressed.

Symptoms

The chief symptom of inflammation of the cervix is **leucorrhoea**. Leucorrhoea is often marked with erosion. Other symptoms such as **pain** may be present. But it is probable that they are due more to the involvement of the uterine body or the pelvic connective tissue than to the cervical condition.

Signs and Diagnosis

In **acute** cases the congestion and oedematous condition of the cervix will be recognised on visual examination aided by the speculum. In gonorrhoea a thick purulent exudate may

be seen escaping from the os, and in it the gonococci may be stained.

In **chronic** cases the enlargement and the erosion, with perhaps the presence of the Naboth follicles, will be recognised. Erosion, from its roughened surface and the fact that it sometimes bleeds on being gently scraped, may simulate epithelioma. To exclude an early malignancy, a piece of tissue should be removed for microscopic examination in every doubtful case. So the hard nodular condition present with the bulging follicles may suggest an early carcinoma. The collapse of the tense swelling when punctured by a knife at once dispels any doubt.

Treatment

Acute cervicitis is treated by rest in bed, accompanied by light diet and aperient drugs. After labour the condition is associated usually with lacerations, and there may be an infective extension into the cellular tissue of the pelvis. In addition the endometrium is often affected as well. In such cases vaginal and intra-uterine douching may be required, with, in some cases, the opening of a parametric abscess through the vaginal vault.

In gonorrhoeal cervicitis quite a different line of treatment is indicated. Here the remedial measures should be localised to the cervix itself, in which the disease is often focussed for a considerable time. Indiscriminate douching may precipitate an infection of the body of the uterus and an extension to the tubes. A speculum is therefore introduced, and applications of protargol or iodine solution are made to the outer surface and canal of the cervix. These are repeated twice weekly.

Vaccine therapy may be a successful adjuvant in some cases of cervical infection.

In **chronic** cervicitis complete removal of the lining membrane with the sharp curette, followed by the application of a strong antiseptic, may be of great value. In resistant cases, accompanied by enlargement and erosion, an amputation of the cervix is indicated, either vaginal or supravaginal, depending upon the degree of involvement of the cervix.

ENDOMETRITIS

Endometritis, or inflammation of the mucous membrane of the uterine body, may be (1) acute, or (2) chronic.

ACUTE ENDOMETRITIS

Pathology.—Puerperal endometritis is the term often applied indiscriminately to all cases of infection in the puerperium. The origin may, however, as we have seen, be in the perineum, the vagina, or the cervix, and not in the corpus uteri. Even in the latter case the term endometritis is a misnomer, for, with the birth of the placenta and membranes, the greater part of the mucosa is shed, and an infection is implanted almost directly on the muscular wall. This explains the frequency of metritis in such cases. Oedema, hyperaemia, and round-celled infiltration characterise the process, and streptococci may be stained where they creep along the tissue planes. Very often a purulent exudate accompanies the condition.

Gonorrhoeal endometritis is almost always secondary to cervicitis. It is very rarely that an opportunity is obtained of examining the mucous membrane in such cases. The changes present differ in no respect from an acute gonorrhoeal inflammation elsewhere.

The changes present in the other conditions that determine an acute endometritis, infection at operation, necrotic tumours, cancer, fibromyoma, etc., consist of an oedematous and haemorrhagic swelling, round-celled infiltration, and a purulent exudate into the uterine cavity.

Symptoms and Signs.—The symptoms and signs of an acute *puerperal infection* are discussed in obstetrical text-books.

In *gonorrhoea* the involvement of the endometrium may give no other signs than those already present with the cervicitis. The first evidence of the upward spread of the disease usually does not appear till the abdominal pain of a tubal infection develops.

The symptoms and signs of an infection *after operation* consist in a rising pulse and temperature, with the escape of a muco-purulent uterine discharge. There may be abdominal pain and tenderness over the pubis.

Submucous *fibroids which become septic* give pain and a foul discharge. There usually is an increase in the size of the tumour. In *carcinoma* the discharge and haemorrhage are largely due to the associated infection.

Treatment.—Removal of the cause is the first essential. In *puerperal* cases, the removal of retained placenta and blood-clot, with intra-uterine douching, and the use of an autogenous or polyvalent vaccine, are all indicated. For the details of such treatment the reader is referred to obstetrical text-books.

In *gonorrhoeal* cases, the careful application of intra-uterine antiseptics, such as iodine or some silver preparation, is advised. A vigorous curettage of body and cervix, followed by strong caustics, may, in a certain proportion of cases, be followed by cure. The use of vaccine therapy in such cases is still on its trial.

In *post-operative* cases an autogenous vaccine should be prepared. Intra-uterine douching is also employed.

In the case of *degenerating tumours* the removal of the growth is the only remedy. In inoperable carcinoma, curettage and the application of strong antiseptics and X-rays or radium are helpful in reducing the sepsis.

CHRONIC ENDOMETRITIS

It is impossible to give a wholly satisfactory description of the conditions embraced under this heading, as they are still imperfectly understood.

The usual text-book description divides chronic endometritis into two types: (1) interstitial and (2) glandular. This classification is artificial, but we adopt it for want of a better.

Chronic Interstitial Endometritis.—Here there is a chronic inflammation which involves chiefly the connective tissue of the mucosa, though in all except slight cases the glandular elements become affected as well.

Etiology.—**Infection** is probably the invariable cause. The factors that cause an acute endometritis, and which have been described in the preceding paragraphs, may operate here also (*q.v.*). It should be remembered, however, that the infection that dates from a labour or abortion, or from gonorrhoea, as also the infection that complicates a degenerating tumour—*e.g.* submucous fibroid—may be insidious and chronic from the beginning.

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FIG. 66.—Tubercular Endometritis.

The chief types of chronic interstitial endometritis met clinically are senile endometritis and tuberculous endometritis.

Senile endometritis is an infective condition affecting women especially after the menopause. The chronic interstitial changes result in the formation of a granulation tissue, which exudes a foul-smelling purulent discharge. The glands in the mucosa shrivel and may disappear.

Tuberculous endometritis is associated with a thickening and later with a caseation of the mucosa. The tubercle follicles may be recognised as pale foci visible to the naked eye. Usually, however, they are only detected on microscopic examination (Fig. 66). Except in the rare cases in which the infection is derived from below, as, for instance, where the woman is infected at coitus, tuberculous endometritis is dependent on a spread downwards from tuberculous tubes. The site in which the disease is specially focussed is, therefore, the mucous membrane near the uterine cornua. A nodular thickening in the region formed partly in uterus and partly in tube is not infrequent in tuberculous salpingitis (*q.v.*).

At a late stage the tuberculous process may involve the entire endometrium forming extensive caseating areas. In this stage secondary infection is a grave risk.

In any condition in which there is a purulent inflammation of the uterus and where the secretions are dammed back by an obstruction in the cervix, *e.g.* a cancer or accidental closure after an amputation of the cervix, an abscess forms in the uterine cavity. This is called **pyometra.** In the process the uterine wall may become greatly thinned out by the tension of the accumulating pus (Fig. 107). In such cases the mucosa of the corpus uteri degenerates and finally consists merely of a granulation tissue.

Chronic Glandular Endometritis.—Here the glandular structure of the mucosa is increased in amount due to a proliferative change. The interstitial tissue may be little altered, or it may betray the original inflammatory stimulus in the presence of thickened vessels and fully formed fibrous tissue. An excess of inflammatory cells, *e.g.* plasma cells, may also be present.

Etiology.—Chronic glandular endometritis has been the topic of considerable discussion within recent years. Some observers believe it to be **infective,** and these point to the above

phenomena of inflammation, which are sometimes evident in the stroma. Other observers deny an inflammatory origin for the glandular proliferation, and attribute it rather to a **neoplastic** change, the whole condition being of the nature of an adenoma. This, in its turn, may depend on a chronic congestive process—*e.g.* in association with a displacement or a fibroid. Still other observers point to the marked proliferation of the glands, which occurs periodically in the premenstrual phase of the monthly cycle. They state that where an excess of the glandular elements is found it simply means that the mucosa has been removed for examination during this active phase, or that the proliferation may, on occasion, persist into the later phases. This, what may be called the **physiological** explanation, is probably partly true, but it fails to account completely for all the phenomena.

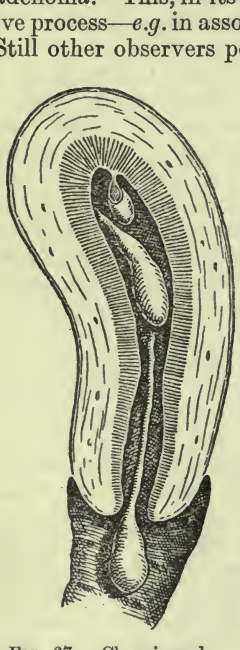

FIG. 67.—Chronic endometritis with mucous polypi.

In the present state of knowledge, it is impossible to be dogmatic as between the first two theories. It is conceivable that, in some cases, the proliferation is inflammatory, whilst in others it is neoplastic. It is well known, however, that an infective agent may induce marked epithelial overgrowth. Examples of this are the venereal warts of the vulva and the marked epithelial hyperplasia which often accompanies tuberculous and gonorrhoeal infection of the Fallopian tubes.

Pathology.—In chronic glandular endometritis there is a **thickening of the mucous membrane,** sometimes to a very marked extent. It may be increased to more than half an inch in thickness (the normal is 2 mm. or $\frac{1}{12}$ in.). The surface becomes folded. Localised digital overgrowths may occur to form **mucous polypi.** These may project through the cervix into the vagina (Fig. 67).

The *microscopic appearances* of glandular endometritis vary greatly in different cases. The common factor present is the

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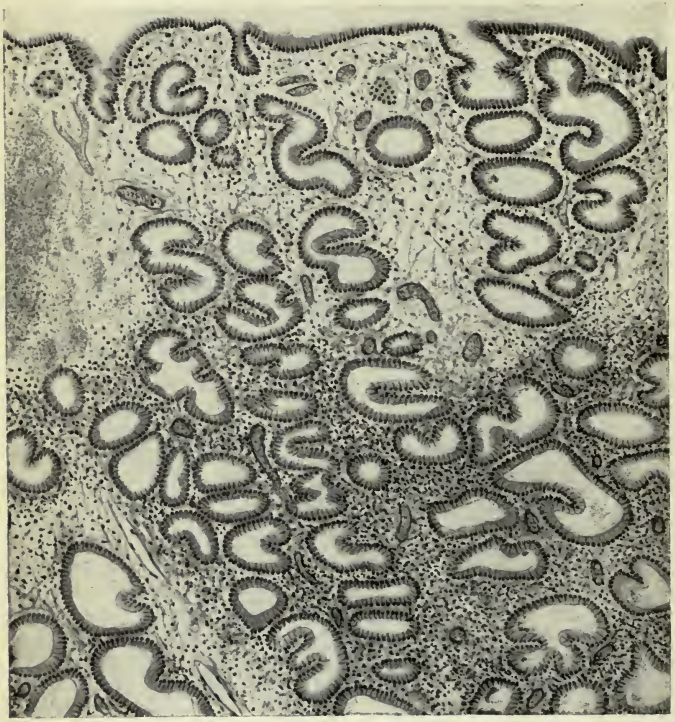

FIG. 68.—Chronic Glandular Endometritis.

gland-proliferation. The glands are more richly present than in the normal mucosa. The tubules are usually tortuous, and on transverse section, instead of being circular, the increase of the epithelium makes them irregular and folded (Fig. 68). Often the wrinkled epithelium dips into the lumen in the form of buds or papillae.

Where the papillary projections into the lumina are numerous and excessive the condition is called **villous endometritis.** In this condition, as in other instances of marked glandular proliferation, it is sometimes difficult to exclude malignancy from an examination of the scrapings.

Symptoms of Chronic Endometritis

The chief symptoms of chronic endometritis are **haemorrhage** and **leucorrhoea.** Menorrhagia, and sometimes metrorrhagia, may be marked in the glandular type. In some, *e.g.* villous endometritis, the blood loss may be so excessive as to cause grave anxiety.

Pain in the back and the lower abdomen aggravated at the menstrual periods may be present, but this symptom always arouses the suspicion of adnexal disease, which commonly accompanies endometritis. An important consideration in chronic endometritis is that the symptoms can often be *traced to a preceding infection—e.g.* gonorrhoea or puerperal. In other cases, however, the puerperal history is meagre or absent, and infection at labour or abortion can only be presumed from the fact that the symptoms have developed since the previous birth or miscarriage.

Sterility is usual in endometritis.

Where the inflammation is due to a necrotic tumour, fibroid or cancer, a foul-smelling discharge is added to the above symptoms.

In *senile endometritis* the bleeding may commence some months or years after the menopause. In such cases a smelling discharge is common. As we know, these symptoms point strongly to carcinoma, and this must be the first suspicion in all such cases.

Tuberculous endometritis is associated with haemorrhage, and there may be a persistent leucorrhoea. The tubal involve-

ment practically always present overshadows in its symptoms the uterine disease (*q.v.*).

Signs of Chronic Endometritis

In a typical case there is little to be discovered on bimanual examination. The uterus is usually somewhat enlarged. It may be retrodisplaced or a complicating tumour, *e.g.* a fibroid may be felt. In senile endometritis the uterus is usually in the shrivelled state of post-menopausal atrophy.

In all such cases a careful examination of the tubes and ovaries is necessary to exclude a chronic salpingo-oöphoritis.

The only definite sign of chronic endometritis are the changes recognised under the microscope in a piece of mucosa removed for examination.

Diagnosis of Chronic Endometritis

As chronic endometritis is one of the uterine bleeding diseases, it has to be distinguished from other conditions which produce the same symptoms.

Retained placental fragments may cause identical symptoms, haemorrhage and pain dating from a miscarriage or labour. Curettage is the only means of clearing up the diagnosis.

Fibroids will be excluded by the usual methods of examination. Endometritis, of course, often complicates fibromyomata.

Metritis (*q.v.*) may accompany the chronic endometritis.

Cancer can only be excluded by curettage, as also **sarcoma** and **chorionepithelioma.**

Treatment of Chronic Endometritis

If the usual *uterine* **styptics,** *e.g.* ergot, fail to cure the menorrhagia and metrorrhagia, **curettage** is necessary. In all cases where the diagnosis is in doubt, and, especially, if cancer is a possibility, curettage must be carried out immediately. In chronic endometritis curettage of the diseased endometrium and swabbing of the uterine cavity with an antiseptic, such as tincture of iodine, may cure completely.

Where the proliferation of the glands is excessive, *e.g.* in villous endometritis, the patient is kept under careful observation, and, on any recurrence of symptoms, **hysterectomy** should be carried out.

Tuberculous endometritis rarely requires treatment of itself. In operable cases of pelvic tuberculosis, the affected uterus is extirpated along with the diseased tubes and ovaries.

METRITIS

Etiology

Inflammation of the muscular wall of the uterus is caused by the same factors as operate in pelvic infection in general (see p. 119). **Puerperal** and **gonococcal** infection probably embrace the majority of cases. Of these two factors, puerperal infection is the more important. This is seen in the fact that more than 80 per cent of cases of chronic metritis occur in parous women.

Post-operative infection and degenerating **tumours,** *e.g.* cancer and fibroids, and the rare cases of spread from an **appendix** or other part of the bowel, or from an ovarian tumour, which has been infected from the bowel after torsion, account for a proportion. **Pyaemic** infection is a rare terminal condition in pyaemia. **Tuberculous** inflammation when spreading from peritoneum or tube may involve the uterine muscle.

Pathology

Acute metritis is probably usual in all acute puerperal infections of the uterus. Swelling and oedema of the muscular tissues, with an extension of the microbes along the intermuscle planes, are present. The same changes occur in all acute cases, no matter from what cause.

Chronic Metritis.—Here there is an increase in the fibrous elements of the uterine wall. The condition has sometimes been called **fibrosis uteri.** Where the chronic inflammation is puerperal in origin, there is often an arrest in the usual healthy involution of the connective tissue and muscular elements of the uterine wall. This condition is called **subinvolution.** Subinvolution is probably always due to an infection at labour.

The large uterus, in such cases, tends to fall back, so that retroversion or retroflexion is common with subinvolution. This retrodisplacement becomes all the more likely, because the chronic congestion of the pelvic structures present with an infection is often associated with an imperfect involution of the supporting ligaments of the uterus.

Symptoms

The symptoms of **acute metritis** are identical with those accompanying the associated acute endometritis.

Chronic metritis occurs usually in women over forty. **Haemorrhage** is the dominating and, often, the only symptom. It often commences as a menorrhagia increasing from month to month, and later passes into the condition of metrorrhagia.

Leucorrhoea, chronic pelvic pain, and *sterility* may also be present.

The symptoms can often be traced clinically to a preceding infection.

Chronic inflammation of the tubes and ovaries is a not uncommon association in these cases, and the pain present may be attributable more to the adnexal than to the uterine disease.

Signs

On examination the uterus is found enlarged and tense. For reasons which have been given, it is not infrequently retroverted.

Diagnosis

The haemorrhage in chronic metritis, occurring as it does in women in the later period of reproductive life, has to be distinguished from *cancer* and *fibroids*. It has also to be distinguished from *retained placental fragments, chronic glandular endometritis,* and *mucous polypi*. Curettage is of no value in diagnosing metritis, for there are no typical changes in the endometrium. Sometimes the endometrium is thickened by chronic inflammation, sometimes it is shrivelled or even absent. Whilst curettage is of no positive help in discovering metritis, it helps by excluding the other conditions. And, as a matter

of fact, metritis can only be diagnosed by an exclusion of the other possibilities.

Treatment

Styptics are futile in controlling the haemorrhage. Curettage is of no value. It is sometimes followed by an exaggeration of the haemorrhage. Amongst the palliative methods of treatment, **X-rays and radium** have recently been strongly recommended by some gynecologists. The haemorrhage, it is claimed, is quickly arrested in most cases. Radiation should not be adopted if there is an associated inflammatory disease of the tubes and ovaries.

If ray-treatment fail, **hysterectomy** is necessary. The operation can usually be carried out successfully by the vaginal route, and the abdominal route will only be necessary where inflammatory disease of the appendages also calls for operative treatment.

CHAPTER XX

INFLAMMATION OF THE FALLOPIAN TUBE AND OVARY—SALPINGITIS AND SALPINGO-OÖPHORITIS

Etiology

The factors operating in a tubal infection are the same as those responsible for a uterine infection. The tube is usually infected by an upward and later extension from the uterus; sometimes the converse is the case—*e.g.* in tubercle, where the uterus is involved in a downward spread from the tube.

For an account of the various causal factors the reader is referred to page 119. **Puerperal infection** and **gonorrhoea** again account for the majority of cases. Necrotic **tumours** of the uterus, **post-operative** *infection*, **appendicitis**, and **tuberculosis** explain others. Rarely a salpingitis is associated with the **exanthemata.**

Salpingitis is usually bilateral. This is accounted for, in the ordinary case, by the spread being upwards from an infected uterus. The same bilateral distribution, however, is found in tuberculous salpingitis, in which the mode of origin is different. Where a one-sided cause is acting, *e.g.* appendicitis, the tubal disease may remain unilateral throughout its whole course.

Salpingitis may be acute or chronic.

ACUTE SALPINGITIS

Pathology

An acute inflammation of the tubes may imply a fresh infection or an acute awakening of chronically inflamed organs. Such exacerbations are common, being provoked by the con-

gestive stimulus of coitus or menstruation, or by a fresh incursion of microbes.

The original infection of the genital canal may be recent, or it may date back to a puerperal or gonorrhoeal attack many months before. In the one case the upward spread of the microbes is rapid, in the other insidious.

Acute salpingitis is usually, if not always, suppurative.

Macroscopic Changes.—The tubes may be free and non-adherent, or merely sticky with fresh lymph. They are swollen and congested and the fimbriae are turgid and angry, and purulent matter may be leaking from the abdominal ostium (Fig. 69).

More commonly the swollen tubes are closed in by fresh

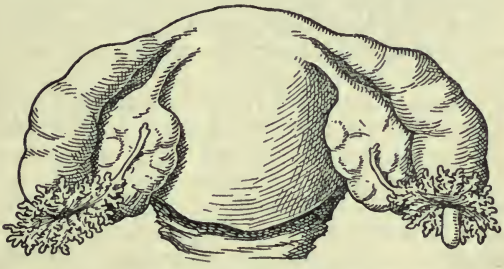

FIG. 69.—Acute salpingitis.

adhesions binding them to uterus, ovary, the opposite tube, rectum, and surrounding peritoneum, and the peri-salpingitic inflammation, at an early stage, leads to the production of a firm mass filling up the pouch of Douglas and often obliterating the outlines of the different organs.

An acutely inflamed appendix dangling over the pelvic brim usually quickly involves the right tube and ovary, and leads to an inflammatory mass situated on the right side.

In salpingitis the **fimbriated opening is usually quickly closed** by adhesions, which bind the fimbriae together. This is the common mode of occlusion of the ostium, though, in some cases, the process is accompanied by a curious retraction of the fimbriae within the opening, which gradually closes down on them until, when the closure is complete, the fimbriae have disappeared from view. This shutting of the fimbriated end

of the tube has a protective result, as it prevents the leakage of the infective matter from the lumen into the peritoneal cavity. As a counterpart to this beneficial action, however, there is the fact that once closed it is doubtful if the tube ever again becomes patent. Bilateral occlusion is thus an important cause of sterility, preventing, as it does, the entrance of the ova.

Another early result of salpingitis is a **blockage of the inner end** of the tube. This is due to a pressing together of the swollen mucous folds across the narrow lumen. The combined closure of the tube at both ends leads to an accumulation of the purulent matter in the intervening distensible part to form a **pyosalpinx.** This is typically a chronic condition, but may occur in the acute stages. The outer ampullary portion is larger and more distensible than the inner isthmal portion. The result is that the tube in its expansion becomes retort-shaped.

From what has been said it will be apparent that, in salpingitis, the infection rapidly extends from the tube to the environing structures. The closure of the ostium prevents a massive leakage of pus, but before this occurs some escape has taken place, and even after its completion an inflammatory spread across the tubal wall takes place.

The **ovary** is quickly involved. It becomes embedded in the general inflammatory process, becoming acutely inflamed, and, in some cases, it may show foci of pus. These foci may correspond to infected Graafian follicles.

Microscopic Changes.—The mucosa and muscle wall are congested and oedematous and infiltrated with round cells. The lining epithelium becomes desquamated and is seen lying in the lumen mingled with pus cells (Fig. 70).

Symptoms

Acute salpingitis causes symptoms of acute abdominal distress, the intensity of which varies in different cases, depending upon the condition of the tubes and the virulence of the responsible germ.

Sometimes the original infection, *e.g.* gonorrhoea or puerperal, may be recent and the patient may still be suffering from the uterine or vulvar lesions. In virulent cases the upward

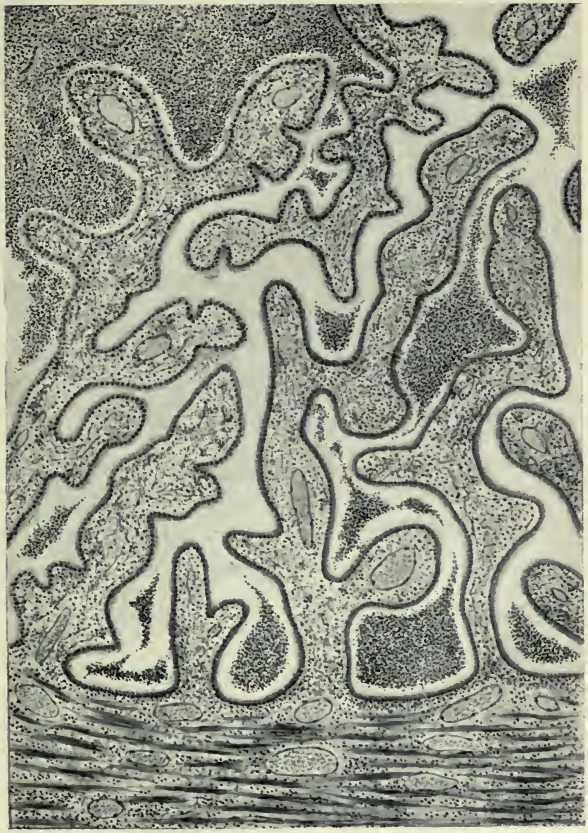

FIG. 70.—Acute Salpingitis.

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spread of the infection may be so rapid that the patient has symptoms of salpingitis within a few days, and a massive peritoneal infection occurs before the abdominal ostium is sealed.

In severe cases sudden and *acute abdominal pain* is the first symptom, at first generalised, then localising itself to the lower abdomen on both sides. Nausea and *vomiting*, coating of the tongue, rising rapidity of the *pulse*, with a raised *temperature*, are all present, and the patient may assume the characters of an acute abdominal crisis within a few hours of the onset of the symptoms.

More commonly the clinical picture is *less severe*. The original infection was weeks or months ago, and there may have been signs and symptoms of a slow involvement of the tubes and ovaries. The acute attack is then more of the nature of a sudden exacerbation.

Pain is again present, though not so acute nor so sudden in onset, the pulse is raised though not so gravely, and the temperature chart swings up at night.

Signs

In most cases the signs are definitely localised. The lower *abdomen is rigid* and both *thighs are raised*. A valuable distinguishing feature in salpingitis is the marked *hyperaesthesia* over an area crossing the abdomen from side to side just above the pubis. The same area is tender on deep pressure, the maximum tenderness being just above the groins on each side.

Bimanually the individual swollen tubes can be palpated in some instances. More often a firm mass is felt behind the uterus occupying the posterior segment of the pelvis. Tenderness is an important feature. Occasionally the tubes are so little thickened that their recognition is impossible. Tenderness on each side in the region of the tubes is then a valuable diagnostic sign.

Occasionally softening, or even pointing into the vaginal vault of a perisalpingitic *abscess*, may be felt.

Differential Diagnosis

Any acute abdominal condition may be confused with acute salpingitis. The conditions most liable to cause difficulty are

acute *appendicitis*, *axial rotation* of the pedicle of an ovarian cyst, and *tubal pregnancy*. The history is helpful in excluding these states. One important differentiating feature, which distinguishes a typical case of acute salpingitis, is the bilateral character of the pain and hyperaesthesia. The bimanual examination adds valuable information.

From such conditions as *renal or biliary colic*, acute *obstruction*, and *rupture of a viscus*, acute salpingitis can usually be diagnosed with ease by a consideration of the symptoms and the physical signs.

Treatment

Palliative.—Most cases of acute salpingitis should be treated palliatively. Rest in bed, light diet, and mild aperients are employed. Antiseptic douching given at a temperature of 110° F. is useful in relieving pain and in diminishing the acute inflammation. Sedatives, such as morphia, may be given hypodermically in acute cases. The above measures are sufficient to tide the patient over the acute phase. The subsequent treatment in the chronic and quiescent stage will depend on circumstances. Each case is treated on its own merits.

Operative.—There are very few cases of acute salpingitis in which an abdominal operation is necessary. An important proviso in all treatment founded on palliation is accuracy in diagnosis. In obscure cases, where the cause of the acute crisis is debatable, immediate laparotomy is necessary.

It is still the case that the majority of these patients are operated on by the general surgeon for appendicitis. It is only comparatively rarely that an acute fulminating salpingitis comes under the care of the gynecologist. In such cases, if the tube is free and pus is leaking from an unclosed ostium, what should be done? Many operators advise removal of the tube or both tubes if they are equally bad. Most cases, however, do well if nothing is done, or nothing more than the introduction of a rubber drain into the pouch of Douglas. The infection becomes localised and resolves or passes into the chronic stage. Such conservative treatment has the advantage of leaving organs necessary for fertility, though it is still a matter for discussion how far inflamed tubes can recover a complete restoration of function.

Where there is evidence of abscess formation evacuation is best carried out through an incision in the posterior fornix. Some blunt dissection may be necessary to localise the pus.

CHRONIC SALPINGITIS—TUBO-OVARIAN DISEASE

Pathology

In chronic salpingitis, just as in chronic appendicitis, the surrounding involvement of structures is often as or even more important, from the pathological point of view, than the condi-

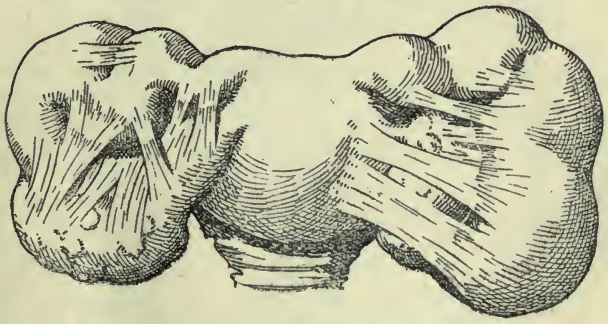

Fig. 71.—Chronic salpingo-oöphoritis.

tion of the infected organ itself. Infected tubes are, from an early stage, accompanied by a pelvic peritonitis and an overflow of the inflammation to the ovaries, and, in chronic cases especially, the presence of peritoneal adhesions and an alteration in the ovarian function are often of greater clinical importance than the changes in the tubes themselves.

Macroscopic Changes.—Chronic salpingitis may be **catarrhal** or **suppurative.** It may succeed an acute attack, or it may have been insidious and chronic from its inception.

In a typical case the tube is thickened and distended, and fixed up against the uterus and ovary by bridging firm *adhesions* (Fig. 71). Sometimes the adhesions are so numerous and so dense that the two tubes, the two ovaries, and the uterus are inextricably embedded in a dense mass of inflammatory tissue

occupying the posterior segment of the pelvis. To this the rectum and small bowel may be adherent.

Closure of the fimbriated and inner ends of the tube often results in the distension of the intervening portion to form, in catarrhal cases, a *hydrosalpinx*, and, in suppurative cases, a *pyosalpinx*. The retort-like distension present in acute cases, and which has already been described, is even more typical here (Fig. 72). In hydrosalpinx the tube wall is thinned, often to the extent of transparency, by the contained fluid, which is clear and watery. In pyosalpinx the tube wall is thick and usually adherent. It is an interesting and important fact that the fluid contained in a hydrosalpinx and a pyosalpinx is usually sterile. The infecting germs have been killed in the stagnant fluid. In some few more recent cases gonococcus or streptococcus may be cultured from the pus.

FIG. 72.—Tuberculous pyosalpinx.

The chronically inflamed tube is uniformly thickened by the inflammatory exudates and by the fibrosis characteristic of chronic inflammation. Sometimes, however, in addition, there may be an active proliferative change in the fibromuscular wall to form a localised tumour-like mass, usually at the isthmal or interstitial portion. The nodule of connective tissue and muscle thus produced has usually tubular incursions of epithelium running into its substance, originating in a proliferation of the mucous membrane of the tubes. This condition is sometimes named *salpingitis isthmica nodosa*.

A frequent result of chronic salpingitis is *retroflexion* of the

uterus due to the cicatricial bands, which form behind the uterus, and pull it and the broad ligaments backwards and downwards.

The **ovary** practically always becomes invaded by the chronic inflammatory process. In slighter cases the adhesions or the chronic thickening of the surface of the ovary prevent the normal development and rupture of the Graafian follicles. The strangled follicles atrophy in some cases, and become cystic in other cases. Ovaries embedded in adhesions often become transformed into a mass of cystic spaces of varying sizes. In later stages cirrhosis may lead to a complete atrophy of the structure and function.

Cicatricial bands not infrequently fix the ovary downwards against the floor of the pouch of Douglas, causing *prolapse of the ovary*.

Chronic *abscess* formation in the ovary may occur in suppurative cases.

Tubo-ovarian cyst or **abscess** is the name applied to a cystic swelling with a wall formed by the displaced and thinned out ovary, and into which the distended tube opens. In the one case the cavity is filled with clear fluid, in the other case with pus. It is always inflammatory in origin. The fimbriae become adherent to the surface of the ovary and, as the tube distends to form a hydrosalpinx or pyosalpinx, the ovary becomes more and more stretched and thinned out over the expanding tubal sac. Some cases of tubo-ovarian cyst may, possibly, be due to the amalgamation of a hydrosalpinx and an ovarian cyst, which have become adherent.

Tuberculous salpingitis is usually bilateral. The primary tuberculous focus may be in the bowel or mesentery, in which case the extension to the pelvis is lymphatic, or the tubes are involved secondarily to a peritoneal infection. More commonly, however, the infection occurs *via* the blood-stream.

The tuberculous deposits may be on the peritoneal aspect of the tube, where they form multiple small whitish or yellowish spots (Fig. 73); or they may occur in the mucosa. Both sites may be involved together. Where the lining membrane alone is infected there may be little evidence of the condition on naked-eye examination; the tube may be little altered in shape or size. In course of time, however, the tubal walls thicken and, after the outer ostium becomes sealed, a tuber-

culous pyosalpinx, filled with cheesy matter, is formed. These are usually bilateral and may grow to a large size.

Extension along the tube lumen or through the muscular wall leads to an infection of the uterine wall. For some time this may remain localised at the cornu, where a solid tumour-like nodule may form as the result of a proliferation in the fibro-muscular and sometimes also the mucous coat. Later more diffuse involvement of the uterus occurs and a spreading tuberculous endometritis develops.

So also a spreading pelvic peritonitis may follow tubal infection (see Chapter XVII.).

Microscopic changes.—In chronic salpingitis, in addition to the thickening of the fibro-muscular wall, the mucous mem-

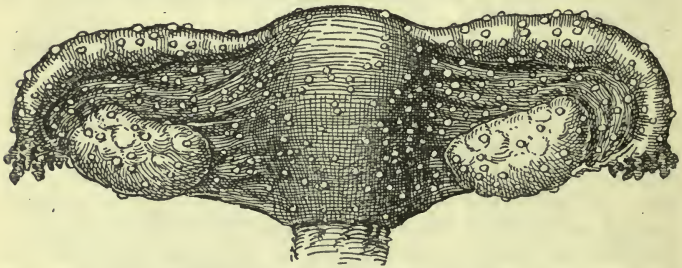

FIG. 73.—Tubercular disease of the pelvic organs.

brane shows a characteristic fusion of the folds across the lumen. In some cases this produces a remarkable sieve-like appearance, when the tube is examined in transverse section. These changes constitute an important cause of tubal pregnancy, for an ovum may readily be stranded in a crypt or *cul-de-sac* formed by the fusion process.

In a pyosalpinx, as in other cases of long-standing suppurative salpingitis, the mucous membrane is degenerated and is transformed into a granulation tissue.

In tubercle the typical follicles are recognised under the microscope.

Chronically inflamed tubes are subject at any time to acute exacerbations. These may occur from coitus or menstruation, after operation—*e.g.* ill-advised curettage, or without any accountable cause.

The question is sometimes asked: "Do inflamed tubes ever recover?" This is a difficult question to answer satisfactorily. It is likely that a mild infection is often followed by complete restoration of structure and function. One tube may suffer less than the other and may recover more readily. After a long period of sterility an infected woman may become pregnant, a certain sign of tubal recovery. A partial restoration of tubal function may, however, end in tubal pregnancy. Severely damaged tubes probably never recover their function. Instead, they may shrivel into mere cords of fibrous tissue.

Symptoms

Chronic salpingo-oöphoritis is usually long-standing before the patient solicits advice. There may be a definite *history of previous infection*, gonorrhoeal or puerperal, or on the other hand there may be none.

The symptoms are, in a typical case, of slow and gradual development, and the patient may be unable to give a definite date to their origin. A frequent history is that they all have commenced since last labour.

Pain in the lower abdomen, flanks, and the small of the back is the dominating complaint. The common site is above the outer end of the ilio-inguinal ligament and extending round in a girdle fashion to the back. Left-sided pain is much more common than right-sided pain in chronic tubo-ovarian disease, and is probably caused by the stretching of the inflamed peritoneal structures, by the peristaltic movements or distension of the rectum. The pain may be almost continuous or it may recur periodically with menstruation. Premenstrual *dysmenorrhoea* is common.

Tubo-ovarian pain is aggravated often by constipation. It is often increased by exertion and relieved by rest. Sometimes, on the other hand, it is worst at night in bed.

Menorrhagia is a common symptom. Metrorrhagia may be present. The uterine haemorrhage is often due to a chronic endometritis. It may sometimes, however, be due to an excessive ovarian secretion attributable to the inflammatory disturbance of the ovary. The destruction of the ovarian tissue by cirrhotic changes, on the other hand, may cause amenorrhoea. This is rare.

Leucorrhoea, due to pelvic congestion or an associated cervical or corporeal catarrh, may be present.

Tender tubes and ovaries lying in the pouch of Douglas may cause *dyspareunia*. Coitus, in its turn, often aggravates the pelvic and abdominal pain. *Sterility* due to the damage of the tubes and ovaries is usual. As resolution takes place the partly recovered tube may become the seat of a tubal pregnancy.

General debility, dyspepsia, and neurasthenia are common. In aggravated cases the patient may be reduced to a state of chronic invalidism. The symptoms of tubal and peritoneal disease of tuberculous origin are discussed in Chapter XVII.

Signs

Subjects of chronic tubo-ovarian pain often carry with them a worried anxious look, and in persisting severe cases anaemia and wasting may be marked.

In some rare cases an inflammatory mass or a pyosalpinx may be felt in the lower abdomen rising from the pelvis. Usually, however, the only abdominal sign elicited on examination is tenderness on deep pressure over the region of the tubes and ovaries.

Bimanually the typical condition felt is a large uterus, with, behind and to the side of it, an inflammatory mass or masses, tender on pressure between the hands. Sometimes resistance only and no defined swelling is felt. The mass or resistance may be more evident on one side than on the other. In the case of a pyosalpinx or hydrosalpinx the rounded contour of the distended tube may be felt on one, or in bilateral cases, on both sides.

The ovary if prolapsed will be felt as a small solid body sensitive on pressure in the pouch of Douglas.

In many cases the body of the uterus is found to be lying backwards in the posterior pouch.

The signs of tuberculous pelvic infection are given in Chapter XVII.

Differential Diagnosis

Chronic tubo-ovarian disease may be confused with chronic *appendicitis*, with which it is sometimes associated. In pelvic

disease the pain and tenderness are lower in the flank than in appendicitis. The history of genital infection and the existence of such purely gynecological symptoms as menorrhagia and metrorrhagia will indicate the source of the trouble.

Cases with haemorrhage have to be distinguished from the purely *uterine conditions causing bleeding—e.g.* fibromyomata, endometritis, polypi, retained fragments of placenta, and cancer.

The firm retro-uterine mass sometimes present in chronic tubo-ovarian disease may simulate a fibroid on a superficial examination. The dominance of pain in the inflammatory condition serves to distinguish it, for pain is relatively rare with fibroids. A careful bimanual examination, if necessary under anaesthesia, clears the diagnosis up.

It is important to distinguish tubo-ovarian disease from endometritis by a careful examination of the pelvis. For a curettage, carried out under the impression that the uterus is alone at fault, may light up an acute exacerbation in chronic tubes.

Where the symptoms of pelvic inflammation succeed a pregnancy, the haemorrhage may be attributed to retained fragments of placenta, until a careful examination of the pelvis and the history of pain reveals the inflammatory origin of the trouble.

Treatment

This may be palliative or operative. The class of treatment to be adopted in any case depends on a variety of circumstances —the local condition, social and family factors, etc. In the majority of cases chronic pelvic inflammation can only be temporarily relieved by palliative measures. A working woman with a family dependent on her energies can ill spare the long period of inaction required for thorough treatment, with the risk, after all, of an early return of her pain and misery. In her the best treatment may be the operative removal of the diseased organs. In a young woman, on the other hand, an operation, which may incur sterilisation, should only be adopted as a last resort. So, in a woman of the more leisured circles, a course of palliative means may be justified rather than immediate recourse to operation.

Palliative treatment consists of *rest, douching,* and vaginal *tamponing* carried out over a period of three weeks or a month. The tampon consists of plugs of cotton wool soaked in some antiseptic such as 10 per cent ichthyol in glycerine. The vaginal vault is first packed tightly and then the remainder of the vagina is filled. The douching is administered night and morning, and the plugs are inserted after the evening douche and removed before the morning douche.

Whilst these local palliative measures are usually only partly successful, in many instances they are sufficient to tide the patient over a period of severe distress. In some cases they may result in cure.

Vaccine and serums are still of doubtful value in the treatment of chronic pelvic disease.

Operative treatment consists of laparotomy followed by separation of adhesions and, in most cases, by the removal of diseased appendages. A guiding principle in all gynecological surgery in the abdomen is conservatism. In young women, and in women under the menopause, who desire children, a functioning tube and ovary should where possible be left, though they be on different sides. In young subjects it is important, also, to conserve ovarian tissue in order to maintain the endocrine secretion necessary for the normal upkeep of the system. Even where the appendages are badly diseased, a portion of ovary can usually be left *in situ.* Where the ovaries are inextricably bound in adhesions and have to be extricated, they should be sliced in saline, and the more healthy pieces used for transplanting into the tissue of the broad ligament or abdominal wall.

Where the tubes are closed by adhesions a new opening may be made in the tubal wall (salpingostomy) to promote fertility. In a few cases pregnancy has been reported after this procedure.

Conservative operations, such as salpingostomy and ovarian resection, are apt to be followed by peritonitic adhesions, which leave the patient's final state worse than the first. It frequently happens that commendable efforts at conservation are thus frustrated. Where the retention of function is not of paramount importance, as in women at or near the menopause, it is usually better to adopt more radical means.

The operations which are applicable to cases of diseased appendages are salpingostomy, salpingectomy, resection or

removal of the ovary, and removal of the tube and ovary (salpingo-oöphorectomy). In aggravated cases, where the uterus is diseased and firmly adherent to the appendages, it may be necessary to do a supravaginal hysterectomy in addition to adnexal extirpation.

All these operations are described in Chapter XXXIX.

INFLAMMATION OF THE OVARY—OÖPHORITIS

Etiology and Pathology

Inflammation of the ovary hardly requires a separate description, for, in nine cases out of ten, the condition is associated with, and is secondary to, a tubal infection, and the symptoms and signs of one are indistinguishable from those due to the other.

The ovary is either infected (1) across the peritoneal cavity, (2) by a retrograde infective thrombosis, or (3) by the blood-stream, which carries the infection by the mesovarian to the hilum.

The first type of inflammation is characterised by an adhesive *peri-oöphoritis*, which binds the ovary to the tube and the adjacent viscera. A tubo-ovarian cyst or abscess may form. Extension through the germinal layer leads to an involvement of the ovarian substance.

Occasionally the right ovary is infected from the appendix.

Ovaries encircled by *adhesions* exhibit well-marked degenerative changes, which are specially evident in the follicles. Normal dehiscence is arrested, with the result that the Graafian follicles degenerate and become cystic. In the course of time the ovary may become replaced by a mass of *cysts* thus formed. Not infrequently the spaces contain dark, chocolate-coloured matter from haemorrhage. *Abscesses* may form in the ovary in other cases.

In retrograde infection, the ovary may remain at first separate from the tube. The same is true of the rare cases of infection of the ovary *via* the blood-stream in which there may be no associated tubal infection. In either case the infection may be pyogenic and may be associated with abscess formation. In other cases it is *tuberculous*.

Infection of an ovarian cyst occurs if removal is not carried out within a short time of the occurrence of torsion of the pedicle. The infection is usually intestinal in origin, for the surface of the congested or strangulated cyst quickly becomes adherent to bowel. In time the infected cyst may be transformed into a bag of pus.

Cirrhosis of the ovary may develop as an end result of inflammation, acute or chronic. The fibrosis may strangle the follicles and the secretory elements in the ovary. Sometimes the cirrhosis is especially evident in the tunica albuginea, in which case superficial cysts due to unruptured follicles collect towards the surface of the ovary.

Symptoms and Signs

These are indistinguishable from salpingitis, acute and chronic (*q.v.*). In the typical case of salpingo-oöphoritis the symptoms and signs are partly tubal, partly ovarian in origin. In one-sided involvement of the ovary the pain and tenderness and the pelvic swelling, where such are present, will be unilateral. Cirrhotic ovaries may be associated with amenorrhoea and sterility.

Treatment

In acute cases *palliative* treatment, consisting of rest, and douching, should be employed. In chronic cases the addition of tamponing to this régime is useful. In chronic cases of ovarian pain, a fly-blister applied over the site of maximum pain may give temporary relief. In persisting cases of ovarian pain, *laparotomy*, with removal or resection of the ovary, is necessary.

CHAPTER XXI

INFLAMMATION OF THE PELVIC CELLULAR TISSUE —PARAMETRITIS

THE parametrium, as the name implies, is properly the connective tissue which surrounds the uterus. It is specially developed round the cervix, and it extends to the lateral wall of the pelvis and into the broad ligaments. Whilst the parametrium is literally the para-uterine cellular tissue, the term parametritis is now used to embrace cellulitis in other regions of the pelvis.

ETIOLOGY

The reader's attention has been directed repeatedly to the fact that inflammation in distant regions of the pelvis may have a common origin. An oöphoritis or a metritis may have arisen as a later stage of the infection causing a Bartholinitis or a cervical erosion. The same considerations apply to parametritis. The discussion of the etiology of this condition is merely a recapitulation of the causes of infection of the genital canal (Chapter XVI.).

The commonest cause of parametritis is infection in association with **abortion** or **labour.** The inflammation spreads along the cellular tissue planes or along the lymphatics, from an infected endometrium or an infected tear of vagina or cervix. In these cases the common organism is the *streptococcus.*

Other infections of the genital canal may overflow into the cellular tissue, such as that associated with degenerating **tumours,** especially cancer, that occurring **after operation** on the vagina or uterus, *e.g.* hysterectomy, **injury** to the vulva or vagina by rape, etc. **Gonorrhoea** is not often associated with cellulitis.

Other rarer causes are infection of a broad ligament **haematoma** caused by the rupture of a tubal pregnancy, and cancer or other ulceration of the rectum.

Pathology

It is apparent, from what has been said, that pelvic cellulitis is usually associated with infection of the vagina, uterus, or tubes. A severe puerperal infection, for example, may combine all at one and the same time.

Acute Parametritis.—The earliest process consists of a mass of indurated tissue round the area of primary infection in cervix or vagina. It may be localised to one or other side, or it may form a girdle of inflammatory tissue round the cervix and vagina. In spreading cases it burrows along the connective tissue planes towards the pelvic wall, laterally or in front or behind. The most common site is the left side of the pelvis, because of the relative frequency of tear of the cervix or vagina on that side.

The *direction of spread* depends on the original site of infection and also on the anatomical arrangement of the pelvic fascia. An inflammation commencing laterally may extend along the base of the broad ligament, the leaves of which are opened apart by the inflammatory exudate. In front, an inflammatory exudate passes round the base of the bladder and following the line of least resistance burrows into the space of Retzius and the continuation of this backwards on each side to the broad ligaments. An exudate in this region may rise above the pelvic brim in front and form a swelling above the groin. Behind, the inflammatory swelling may creep between uterus and vagina in front and the rectum behind.

Even an extensive cellulitis may soften and *subside by absorption*. A remarkable change in the exudate sometimes happens in the form of a *solid coagulation*. Local or diffuse areas of densely hard consistence are produced, often stony in their hardness. These areas have been likened to the condition that would be produced were fluid plaster of Paris poured into the cellular tissue of the pelvis and allowed to consolidate. Isolated nodules of this tissue in the later stages may remain adherent to the pelvic walls and are often mistaken for a true bony growth.

Suppuration and *abscess* formation frequently occur in the acute stages of a cellulitis. The abscess may point in the rectum, vagina, bladder, abdominal wall, or it may burrow into more distant parts, simulating a kidney or appendix abscess.

An important sequel of pelvic cellulitis is *thrombosis* in the veins of the iliac system. A mild thrombotic process may lead to a spreading blockage of the veins ; a retrograde spread into the common iliac vein, started by a pelvic infection, is the chief cause of phlegmasia alba dolens. Septic thrombi constitute an important means of *blood infection*, and detachment of a thrombus is the cause of the tragic fatalities in the puerperium, when a *pulmonary embolus* may kill within a few minutes.

Cancer of the cervix is associated with a cellulitis spreading from the necrotic surface, and it is sometimes difficult to tell how much of the induration round, and fixation of, the uterus is due to cancerous spread, and how much to a cellulitic process. Sometimes this question can only be determined by operation.

Chronic parametritis is a cicatricial process characterised by the formation of *shortened bands* of tissue that displace and immobilise the pelvic viscera. In the most common condition, shortening of the lateral parametric tissues, more often to the left side, drags the uterus over to that side or, by pulling the cervix over, it may lever the body to the other side. So, cicatricial bands in the region of the utero-sacral ligaments may pull the whole uterus backwards into the hollow of the sacrum. In the process the uterus may become acutely anteflexed.

Symptoms

In the **acute parametritis** of puerperal infection, the symptoms are those which are associated with this infection. The usual clinical picture is a swinging temperature chart, pain in the lower abdomen, infected lochia, raised pulse rate, etc., the first evidence that something is wrong appearing three or four days after labour. At this there may have been delay or difficulty, and lacerations may have been recognised in cervix or vagina. The clinical picture is indistinguishable from uterine infection, with which parametritis is often associated.

Spontaneous absorption of the exudate may occur in a week or ten days in mild cases. In severe cases it may require months for complete resolution to take place.

If it does not tend to resolve, sudden elevations of temperature at night with rigors and sweatings indicate abscess formation. The infection if virulent may extend rapidly and may prejudice life, especially if blood infection occurs. Or, at any time, the escape of pus from the rectum, which is the commonest avenue of natural evacuation, is followed by a sudden subsidence of the symptoms.

Spreading exudates form painful swellings. One of the commonest sites for this is in the lower abdomen just above the groin.

Thrombotic blockage of the pelvic veins results in oedema of the leg or legs which may proceed to the formation of an intractable and painful phlegmasia.

Clinical manifestations similar to the above occur in a parametritis supervening after a pelvic operation, such as hysterectomy. In this case, if abscess formation takes place, the pus will tend to evacuate naturally through the vaginal vault in the case of complete hysterectomy, and through the cervix in the case of supravaginal hysterectomy.

Many of the symptoms in cases of cancer of the uterus, pain, fever, etc., are due to the complicating cellulitis. The same is sometimes true of septic fibroid tumours lying in the cervix or vagina.

Chronic parametritis is clinically marked by displacement and fixation of the viscera, especially the uterus. Lateral and posterior deviations may in this way be produced, associated with pelvic pain and discomfort.

Signs

Tenderness is present in the lower abdomen with, in some cases, a tender swelling rising above the brim and felt under the anterior abdominal wall. An abscess may point here. The signs are usually more marked on one side than the other. There may be an infective discharge from the vagina. On vaginal examination a firm tender swelling is felt localised, or, in aggravated cases, diffused widely throughout the pelvic cellular tissue. The swelling is felt bulging under one or other

of the vaginal fornices. In older cases the exudate may be densely hard. If, on the other hand, an abscess forms, the mass becomes softened and very painful to the touch.

Differential Diagnosis

In puerperal cases it is important from the point of view of treatment to discover the seat of infection. The subsidence of the symptoms after intra-uterine douching points to the uterus itself as the site. In cases which resist the ordinary methods of treatment it may not be for some time, when a palpable exudate forms, that a parametritis is recognised as the cause. In many cases, of course, there may be a combined uterine and parametric infection.

Solid masses of exudate in the pelvis are constantly mistaken for fibroids and bony tumours. The history of a recent labour suggests parametritis, and a careful bimanual examination disposes usually of any ambiguity there may be. A cellulitic mass behind the uterus may be confused with the inflammatory mass of a salpingitis, and in some cases there may be considerable difficulty in the distinction. The cellulitis is at a lower level, often surrounding the cervix, whereas the salpingitic mass rises higher in the pelvis.

Treatment

In **acute parametritis,** *rest* and frequent hot *vaginal douching* are used, combined with judicious *purgation,* which causes a depletion of the inflamed tissues. An *abscess is evacuated* through a small incision made through the vaginal wall with the patient in the lithotomy position and the posterior vaginal wall held back by a speculum. The cervix is steadied by a volsellum, a small incision is made over the most prominent part of the swelling, and if pus does not immediately flow, a blunt pair of forceps is pushed in to locate the abscess. Gentle pressure above the pubis is used to empty the abscess cavity and a rubber tube is introduced for drainage. Any searching for pus must be done with blunt forceps, as, otherwise, the large uterine vessels may be punctured. An abscess pointing on the anterior abdominal wall is emptied through an incision.

Chronic parametritis is treated by *douching* and *tamponing*, which will promote the absorption of intractable exudates. Cicatricial bands dislocating the uterus and dragging on the other viscera may sometimes be stretched by vaginal *massage*, if they do not react to a course of douching and tamponing.

SECTION VI

EXTRA-UTERINE PREGNANCY

CHAPTER XXII

PREGNANCY IN OVARY, ABDOMINAL CAVITY, AND FALLOPIAN TUBE

PREGNANCY outside the uterus may occur in three sites :

1. Ovary.
2. Peritoneum of abdominal wall.
3. Tube.

Ovarian pregnancy is rare, though quite a number of authentic cases have been recorded. Here the ovum is fertilised in the follicle by a spermatozoon, which enters through the opening by which the ovum is about to be dehisced. The earliest stages of the pregnancy occur in the ovary, the substance of which is stretched over the expanding embryonic sac. The ovarian tissue is ploughed up by haemorrhage provoked by the stimulus of the growing chorion, and the pregnancy in most cases comes to an end by intraperitoneal rupture of the sac, which is accompanied usually by severe internal bleeding. If the ovum continues to grow beyond a certain limited size, the expanding sac gradually wears through the surrounding ovarian tissue and comes up against the surrounding structures, *e.g.* tube, uterus, bowel, etc., which are embraced as new boundaries for the sac. In this stage the pregnancy is difficult to distinguish from a tubal pregnancy. So easy is the confusion, that it has come to be

laid down as a necessary condition before a gestation sac can be pronounced to be ovarian, that the tube on the same side should be free from the ovary throughout its entire length.

In its pathology ovarian pregnancy closely simulates tubal pregnancy, whilst its symptoms, signs, and treatment are the same.

Abdominal Pregnancy.—In the lower animals a primary engrafting of a fertilised ovum on the peritoneal wall of the pelvis has been described, and it is conceivable that the same aberrant site may be the seat of pregnancy in the human. If so it must be of extremely rare occurrence.

TUBAL PREGNANCY

This is by far the most common situation for extra-uterine pregnancy. It is a condition of comparative frequency.

Etiology

Obstruction to the passage of the ovum is the factor responsible. This may be due to *congenital* conditions, such as a local or a general infantile narrowing of the tube, persistence of the convolutions, which characterise the foetal tube, or the presence of tubular diverticula extending from the mucosa into the muscular wall of the tube, and into one of which an ovum may stray.

The most common causes, however, are *acquired*, and, of these, **salpingitis** is the dominating cause. The actual factors operating here may be several—fusion of the folds forming crypts and lacunae, diverticula formed by an inflammatory incursion of tubular growths of mucous membrane into the muscular wall, deficient peristaltic contraction of the tubal muscles, or external adhesions leading to a kinking of the tube.

Pathology

The ovum may grow in any part of the tube, and tubal pregnancies are described as (1) ampullary, (2) isthmal, (3) interstitial (Fig. 83), (4) infundibular, according to the site. The most common is ampullary, the next in frequency being isthmal. An interstitial pregnancy grows in the part of the

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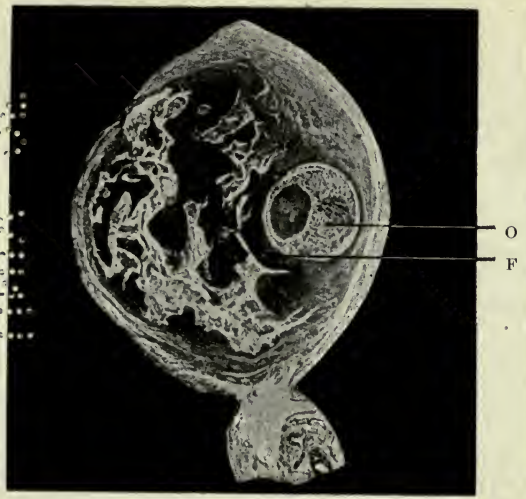


FIG. 74.—Transverse section of pregnant tube (Wade and Watson).

The lumen of the tube (O) is intact and filled with catarrhal debris. It is separated from the implantation cavity containing the ovum and chorionic villi, by (F) a "capsular membrane" consisting mainly of fibrin.

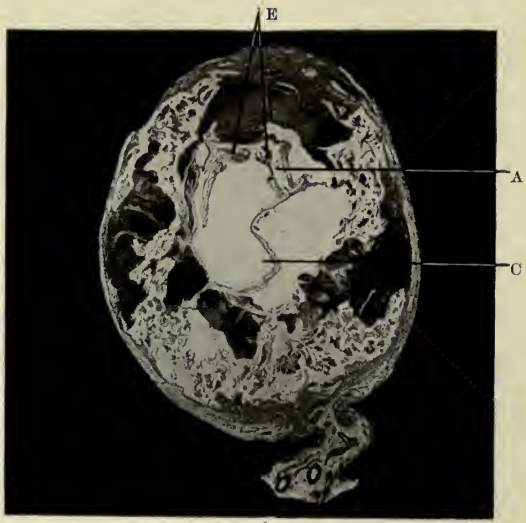


FIG. 75.—Section of same tube through the centre of the gestation sac, which has entirely obliterated the lumen (Wade and Watson).

E is the embryo, A the amniotic cavity, and C the chorionic vesicle. The rest of the tube is filled by chorionic villi and blood.

tube that channels the uterine wall and expands the uterine cornu during its growth.

In normal uterine pregnancy the ovum grows in the mucous membrane, and it is possible that, in some cases of tubal pregnancy, the earliest stages are passed in the mucous lining of the tube. Very soon, however, the expanding sac burrows clean into the muscularis, and in those cases, in which the ovum has wandered along a diverticulum, the blastocyst cavity is embedded in the muscular wall from the beginning.

If examined at an early stage the implicated part of the tube is expanded by a localised, spindle-shaped swelling, the surface of which is deeply congested and purple. Under the microscope on section the rounded blastocyst is seen, with the numerous young villi sprouting from its surface, and lying in the blood lake that envelops the whole. The adjacent wall of the tube is expanded to form the implantation chamber, and all round it the muscle is degenerating and necrotic and ploughed up by spreading areas of oedema and haemorrhage. This is poured out from the vessels, whose walls are gaping and often broken up by the chemical material derived from the chorionic cells. In early cases the tubal lumen is still visible, displaced in an eccentric manner (Fig. 74).

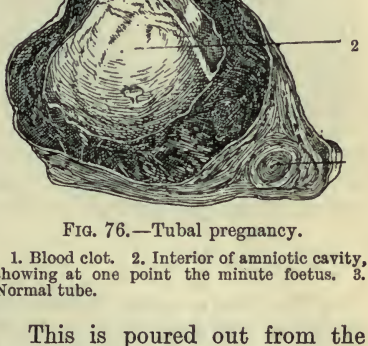


FIG. 76.—Tubal pregnancy.

1. Blood clot. 2. Interior of amniotic cavity, showing at one point the minute foetus. 3. Normal tube.

The intimate microscopic changes in the tubal wall are haemorrhage and degeneration passing into necrosis in the immediate proximity of the ovum. The formation of a decidua enclosing and supporting the embedding chamber, such as occurs normally in the uterus, is never seen in the tube. Here and there the connective tissue cells in the muscular wall may expand in a decidua-like manner, and the mucous folds throughout the remaining part of the tube may become turgid with a true decidua. But, naturally, none of these deciduae are of

any value to the growing ovum. A decidual reaction is not limited to the tube, for, with the growth of the tubal ovum, the mucosa of the uterus becomes thickened to form a decidua indistinguishable from that of a healthy pregnancy.

Not infrequently, in addition to the above changes, there may be in adjacent parts of the tube evidence of a salpingitis, such as fusion of the folds, inflammatory thickening of the muscular coat, or diverticula of mucosa.

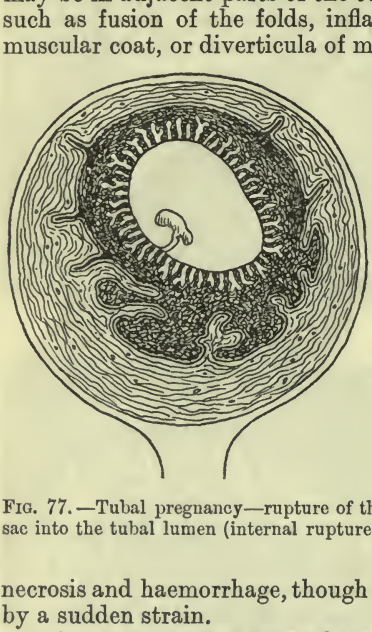


Fig. 77.—Tubal pregnancy—rupture of the sac into the tubal lumen (internal rupture).

The subsequent fate of a tubal gestation depends on a series of circumstances. In some cases the haemorrhage provoked by the growing ovum at an early stage swamps and strangles the ovum, where it lies in the muscular wall. The blood clot containing the fragmented remains of the ovum may gradually be absorbed and leave little permanent evidence behind.

In most cases, however, **rupture of the tube** takes place. The breach in the tube is due to necrosis and haemorrhage, though it may be finally determined by a sudden strain.

Internal Rupture or Tubal Abortion.—Here the break occurs into the tubal lumen, into which the gestation sac in whole or part may be forced (Fig. 77). A *haematosalpinx* is produced, which may after a time be absorbed. In most cases, however, a leakage of blood along the tube into the peritoneal cavity accompanies the rupture, and, if excessive, may cause dangerous or even fatal internal bleeding. The leak may be nothing more than a gradual trickle, which clots round the tubal fimbriae, or in the pouch of Douglas to form a *haematocele*. This may increase in size by gradual accretions of new clot

until a large swelling is formed, filling up the pouch of Douglas. It may overflow into the utero-vesical pouch, and in some cases it forms a mass felt in the lower abdomen. The tendency is for such blood accumulations to become closed in by *adhesions*, and the mass formed may include ovaries, uterus, and other viscera.

Not infrequently, after becoming ruptured into the tubal lumen, the ovum sac is pressed along the tube and is finally extruded into the peritoneal cavity, where it is found lying amongst the blood clot. In some cases the ovum is found in the act of extrusion through the dilated fimbriated opening. In an interstitial pregnancy rupture into the lumen may be followed by an escape of the ovum sac into the uterus, and its discharge from the vagina may be mistaken for an ordinary uterine abortion.

External Rupture.—Here the tube gives way on its outer aspect. The breach takes place in one or other of two sites : (*a*) on the free peritoneal surface or (*b*) on the fixed broad ligament aspect. The situation of the gestation sac in the tubal wall, and the site of greatest thinning, will determine the locus of the rupture. In either of the above two sites, the breach may be sudden or slow, and the clinical course and subsequent fate of the ovum hang on the mode in which the break is produced.

Sudden Rupture

On Peritoneal Aspect.—Here a gaping wound in the tubal wall is produced, with a laceration of the large arterial and venous twigs in the vicinity of the foetal sac. The result is severe and persisting bleeding into the abdomen, which is arrested only by the operative removal of the tube, or by the collapse or death of the patient. In most cases the ovum is still in a very early stage of growth, and the local disaster ending in rupture results in its immediate death. The gush of blood may loosen it from its roots and sweep it into the peritoneal cavity (Fig. 78).

On Broad Ligament Aspect.—A sudden breach on the broad ligament aspect produces similar results, haemorrhage into the broad ligament (*haematoma*) and death of the ovum (Fig. 79). The restraint of the broad ligament, however, prevents

the excessive and dangerous blood-loss characteristic of intraperitoneal rupture. The haematoma may be gradually absorbed or it may cause subsequent trouble by being infected from bowel.

Sudden breaking through of the tube wall is naturally likely, only if the tube remains free and non-adherent over the area occupied by the growing sac.

Gradual Rupture

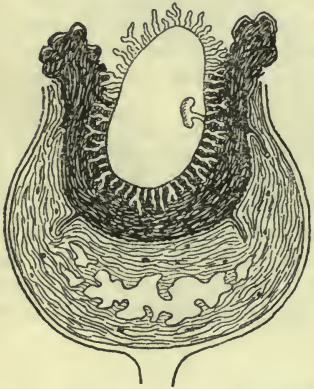


Fig. 78.—Tubal pregnancy—sudden intraperitoneal rupture.

On Peritoneal Aspect.—The power of expansion of the tube is very limited, and after a few weeks' growth the tube is unable to cope with the developing ovum. The expansile power of the tube is further confined by the degenerative change which characterises the aberrant pregnancy. But after the earliest stages the walls are enclosed and strengthened by surrounding adhesions and a sudden breach is prevented. Under these conditions the giving way is more gradual; the tube becomes rather dissolved in front of the enlarging sac, and, if the adhesions are sufficiently strong, they are now embraced in the new confines of the sac. Thus it happens that, where a gestation progresses to any length, the foetal envelope is formed by new adhesions and by neighbouring organs, which have formed adhesions that nourish the tissues of the placenta and the foetus (Fig. 80). Uterus, rectum, mesentery, small and large bowel, and liver, may all be found forming part of the boundary, becoming adherent one after the other as the size of the sac increases. By such a process as this, a foetus, which started its growth in the minute sac of a tube, may go on developing to the fifth, sixth, or even later month. In rare cases full term may be reached. One hundred cases of full-

term extra-uterine pregnancy have recently been collected from the literature.

In some of these cases the foetus may develop healthily and, after delivery by operation, may survive. In a large proportion, however, the irregular constriction of the sac and the existence of amniotic adhesions lead to foetal deformities. These, and the imperfect foetal nourishment, prejudice the child's life. In only about 20 per cent of such cases that go to term is the child born alive. About half of these are maldeveloped and a considerable proportion die.

In most cases, some unfavourable incident, such as damage due to strain, or haemorrhage into the sac, or infection, terminates the life of the foetus. The sac begins to shrink after the foetal death, and the symptoms subside and may disappear. Cases have been recorded, in which such a sac has lain for years, without causing any untoward effects. An indolent sac containing the dry bones or the calcified remains of a foetus may be all that is left.

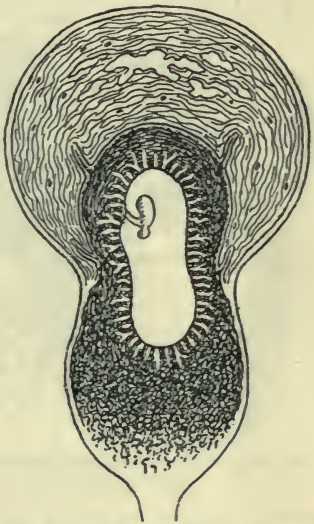


FIG. 79.—Tubal pregnancy—sudden rupture into broad ligament.

On Broad Ligament Aspect.—A fate somewhat similar to that just described for an intraperitoneal sac may befall a case associated with gradual rupture between the layers of the broad ligament (Fig. 81). If the foetus survives, the sac may go on growing retroperitoneally, and in the process may lift the peritoneum widely from the abdominal wall and rectum, and may even burrow between the mesenteries of the large bowel.

Infection in association with tubal pregnancy is not uncommon. A haematocele or a haematoma may become

infected from the bowel, causing in the one case an adhesive peritonitis, in the other case a cellulitis of the broad ligament. Or the sac of a pregnancy may be infected from the adherent bowel. In any of these conditions, abscess formation may occur and the abscess may evacuate itself into the bowel, the bladder, the vagina, or through the abdominal wall. An interesting condition in this connection is where the abscess

FIG. 80.—Tubal pregnancy—the sac has eroded through the walls of the tube and is adherent to uterus and omentum.

cavity of a tubal pregnancy ruptures into the rectum or some other site and the foetal bones are passed one after the other through the anus or bladder, etc.

Changes in the Uterus in Tubal Pregnancy.—In tubal pregnancy characteristic changes occur in the uterus. The body enlarges until it may reach the size of about a two months' gestation and the cervix becomes softened. The mucous membrane of the body becomes transformed into a decidua indistinguishable from the decidua of a normal pregnancy, though, of course, it contains no traces of foetal elements.

Symptoms

Tubal pregnancy in the beginning may be indistinguishable clinically from ordinary pregnancy. There may be amenorrhoea, morning sickness, enlargement and tenderness of the breasts, abdominal swelling, etc. So long as the foetus continues its development without incident there may be no symptoms to denote the aberrant pregnancy, except, perhaps, excess in the morning sickness, and vague, recurring, abdominal pains caused by the burrowing and stretching of the sac as it establishes its new boundaries. A foetus may sometimes grow to full term without arousing any suspicion of its aberrant location till the onset of spurious and futile labour pains specially attract the attention of the medical attendant.

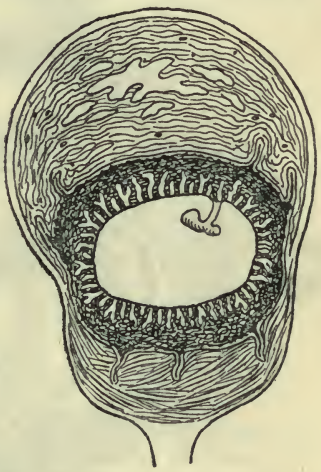


Fig. 81.—Tubal pregnancy—gradual rupture into broad ligament.

The first symptoms of an exaggerated kind follow damage of the foetal sac. The time of onset of these symptoms varies in different cases and not infrequently follows some sudden strain or exertion, *e.g.* dancing or a fall. It may be in the early weeks, and even before the sac is a month old, in which case there will be no history of amenorrhoea. It is usually somewhat later, about the second or third month. But it may be still further postponed.

Stabbing pain in the lower abdomen, to one side or the other, is the first symptom in the majority of cases. It may come and go, recurring with increasing intensity, associated with nausea and vomiting when severe. After persisting for some time, the pain may subside or even disappear altogether, when the tubal disaster was sufficient to kill the foetus, but not enough to induce more dangerous effects on the mother. The absorp-

tion of the clot in the tube, peritoneal cavity, or the broad ligament, and the shrinkage of the sac, may spell an end of the trouble.

Or, instead of recurring pains, in cases of sudden intra-peritoneal rupture the pain may come on with dramatic suddenness, causing the patient to double up in agony. Here

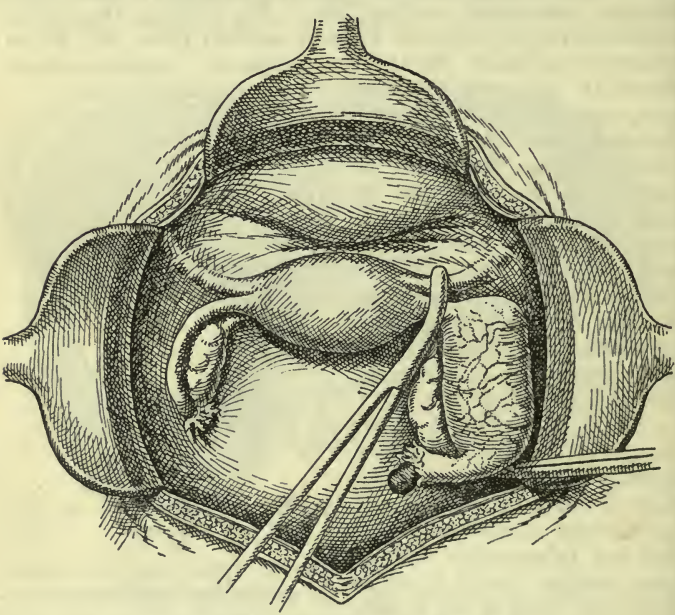


FIG. 82.—Tubal pregnancy—removal of sac.

the sudden anaemia and **collapse,** with a rapid pulse, and all the symptoms of an acute abdominal crisis, usually make the exact cause of the grave state of the patient clear. Unless an immediate operation is carried out, the patient may succumb from internal haemorrhage.

Haemorrhage from the vagina is the other cardinal symptom. This is due to the separation of the uterine decidua that accompanies damage of the foetal sac or death of the foetus. The bleeding varies in amount. It may be a mere "show."

It is never excessive. With it there may be the discharge of a cast formed by the shed decidua. On being floated out in water, this, if complete, is found to have the triangular shape of the uterine cavity. Under the microscope this decidua is similar to that formed in uterine pregnancy, but, of course, there are no foetal elements in it.

Other less constant symptoms may be present. Infection of a haematocele will cause peritonitic symptoms; of a haematoma, symptoms of an acute parametritis. It should be

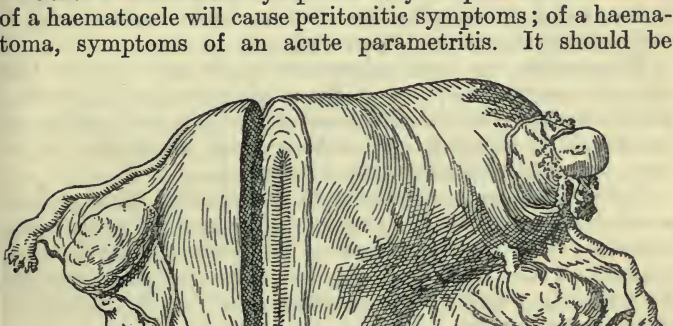


FIG. 83.—Tubal pregnancy occurring in the interstitial portion of the tube. (From Professor Harvey Littlejohn's collection, by permission.)

remembered that the gradual leakage of blood into the peritoneum may be accompanied by a swinging temperature chart which suggests an infective process.

SIGNS

These may simulate the *signs of a normal pregnancy* in so far as the breasts, the abdomen, and even the uterine enlargement, are concerned.

Tenderness and rigidity of the abdomen low down and to one or other side is an important sign. It may, however, only be present after tubal rupture. With *sudden intraperitoneal*

rupture the abdominal signs become diffused and then are accompanied by severe pallor of the face. In such cases the abdominal tenderness is acute, and, even when diffuse, it is more prominent usually low down on the affected side. The same characters apply to the rigidity. It should be remembered, however, that the signs of abdominal crisis may remain diffuse throughout, for blood widely scattered in the peritoneal cavity is apt to cause acute tenderness and boarding over a large area similar to acute peritonitis.

Bimanually, the local *enlargement of the tube* may be felt even at an early stage, lying to the side of or behind the uterus. With a haematocele the firm rounded swelling is felt filling up the pouch of Douglas, and perhaps rising above the pelvic brim, when it is felt in the lower abdomen.

Tubal pregnancy progressing to later months of pregnancy is associated with a gradually increasing tumour of the abdomen, and the presence of such signs as ballottement, foetal movements, and the foetal heart may make the condition resemble a uterine pregnancy. The swelling, however, throughout is often asymmetrical.

Differential Diagnosis

In the early stages tubal pregnancy is usually mistaken for an **ordinary gestation.** Later the aberrant site is distinguished by the recurring and stabbing pain in the lower abdomen to one side or the other, and the swollen tube beside or behind the uterus felt on bimanual examination.

In still later stages an extra-uterine pregnancy developing in the abdomen is recognised by the occurrence of recurring abdominal pain and vaginal bleeding, both of which may persist till the end. The asymmetrical position of the abdominal swelling and the recognition bimanually of the small uterus which is separate from the pregnancy, are helps in diagnosis.

The pain and the bleeding which attend tubal death or damage, occurring in a woman known or suspected to have been pregnant, are apt to give the idea of **abortion.** The pain in tubal cases, however, differs from the pain of abortion, which commences in front but soon works to the small of the back and becomes rhythmic in character. In tubal pregnancy, also, the vaginal bleeding is slight as contrasted with abortion.

The escape of the decidual cast of the uterus in a case of tubal pregnancy may suggest the foetal sac of an early abortion. In a doubtful case the microscopic recognition of foetal villi, of course, shows that we are dealing with a uterine gestation. Villi, however, are sometimes difficult to find, and a failure to find them is not of itself sufficient evidence on which to base a diagnosis of tubal pregnancy.

The enlarged uterine body lying in the pouch of Douglas in the case of a **gravid retroversion** may resemble a tubal gestation. In both the symptoms of pregnancy are present, and in both abdominal pain is common. In retroversion, by the third month of pregnancy, retention of urine with distension of the bladder is frequent. Moreover, on bimanual examination, under an anaesthetic if necessary, retroversion can usually be recognised and corrected. In the days before the possible occurrence of a pregnancy in the tube was recognised, such cases were often mistaken for gravid retroversion. Attempts made at reposition naturally ended in rupture and disaster.

Pyosalpinx may sometimes be a source of confusion. It will be remembered that there is often a history of preceding infection in cases of tubal pregnancy, and for this reason the tender tubal swelling may easily be taken for a pus sac. There are usually distinguishing features, such as, in the one case, the symptoms and signs of pregnancy, and in the other case, a more definitely bilateral involvement of the tubes, and signs of fever. Sometimes, however, the diagnosis is very difficult and can only be settled by laparotomy.

Fibroid and ovarian tumour may both be suggested by a tubal sac, but the history and the physical signs are usually sufficient to clear up the diagnosis.

Treatment

As soon as a diagnosis of active tubal pregnancy is made, laparotomy and removal of the tube should be carried out. This has to be carried out immediately in the case of an intraperitoneal rupture to prevent loss of life due to bleeding. In other cases the less the delay in operating, the more likely is one to forestall rupture. Great care is required in moving the patient to hospital or to nursing home.

The operation is simple. The abdomen is opened through

a longitudinal mesial incision. If rupture has taken place the blood-clots are rapidly removed sufficiently to allow of a recognition of the tube. This is clamped on the uterine side of the sac, the infundibulo-pelvic ligament containing the ovarian vessels is caught in a clamp, and the tube is excised (Fig. 82).

It is often necessary to separate recent adhesions, which surround the tubal sac and the poured-out blood, before the tube is liberated sufficiently to allow of removal being carried out.

Where the pregnancy is presumably dead in the tube, or a localised extravasation in the broad ligament or pouch of Douglas is all that remains of it, the best treatment is expectant. The condition usually settles down, the clot is gradually absorbed, and even when the gestation has progressed beyond the earlier stages, the symptoms subside completely. Any hint of infection in the shape of pain or fever, or any later suspicion that, after all, the pregnancy is still active, should be treated by operation.

Infection of a mass of blood-clot is usually quickly followed by abscess formation. This may break through into the rectum and subside spontaneously. In other cases it bulges into the vaginal vault or even on to the surface of the abdomen. In either case it is to be treated by incision and the introduction of a pair of blunt forceps to find and liberate the pus.

The treatment of extra-uterine pregnancy at or near full-term consists in immediate operation. In this way there is a hope of saving the child, and one has to remember that the risks of infection and adhesions increase with the time that is allowed to lapse. In some cases the whole sac may be removed by careful dissection. In other cases the adhesions prevent its removal in whole or part, and, after being brought to the surface, the opening is stitched to the abdominal wall and the cavity is packed with gauze, in the hope that shrinkage will eventually close it up. This is called marsupialization of the sac. If the placenta is adherent, it is well to allow it to separate itself at leisure, after thrombosis of the retroplacental vessels. In this way the risk of severe immediate haemorrhage is prevented.

SECTION VII
NEW GROWTHS

CHAPTER XXIII

NEW GROWTHS OF VULVA, URETHRA, AND VAGINA

NEW GROWTHS OF THE VULVA

Hypertrophy of the Clitoris is usually *congenital.* The enlarged clitoris may grow to a considerable size. The *acquired* type is due to a chronic irritation, either of inflammation or masturbation.

Hypertrophy of the Labia Minora.—This may be *congenital.* One or both nymphae hang down as pendulous folds. The condition may be *acquired.* It is commonly believed, without sufficient reason, that it is apt to be caused by masturbation. In the Hottentots a great lengthening and enlargement of the nymphae is produced artificially by certain methods, which are begun in the infant child.

The *treatment* of hypertrophy of the clitoris and nymphae is removal of the redundant tissue, if this is necessary because of irritation or dyspareunia. Otherwise no treatment is required.

Simple Tumours

Fibromata and **fibromyomata** are occasionally found as pedunculated tumours growing from the labia. They may reach a large size. They tend to become irritated and ulcerated.

Lipoma.—This is not common. It usually develops from

the labium majus as a pedunculated growth. It may, however, be sessile.

Papillomata.—These occur as single or scattered growths. Diffuse warty growths on the labia and thighs are a common sequel in a case of old-standing venereal infection (Fig. 60). Papillomata are not necessarily, however, gonorrhoeal.

Adenomata arise from the urethral lumen, the Bartholin gland, or in the labium minus or majus.

Adenomyomata occasionally arise in the upper part of the labium majus in the vicinity of the superficial abdominal ring. They form a solid or cystic tumour, the true nature of which may only be divulged after its removal. Sometimes, however, the nature of the tumour may be recognised clinically by the swelling and tenderness it exhibits during the menstrual period.

Malignant Tumours

Squamous Epithelioma is a comparatively rare tumour (Fig. 84). It arises either in the clitoris, the urethral orifice, or the labia. It is a late manifestation of some cases of leukoplakia vulvae. The tumour commences as a hard superficial nodule or warty growth or as an ulcer. An interesting feature of vulvar cancer is the frequency of multiple discrete growths. Sometimes, as, for example, in the labium majus, a contact spread to the apposed surface of the opposite labium may be noted. Extension to the inguinal glands is comparatively early.

Adeno-carcinoma may originate from the Bartholin duct or gland. Extension to the inguinal glands is apt to occur.

Rodent Ulcer is very rare.

Melanotic Sarcoma and Carcinoma.—This forms a rare pigmented tumour in old women, which grows on the labia majora or minora or clitoris. It often originates in a pigmented skin mole. It is more commonly a carcinoma than a sarcoma. Microscopically the granules of the brownish pigment, melanin, are seen in the cells and in the connective tissue planes.

The *prognosis* is very grave.

Sarcoma is rare.

The **treatment** of malignant tumours of the vulva consists in early and extensive removal with extirpation of the inguinal lymph glands.

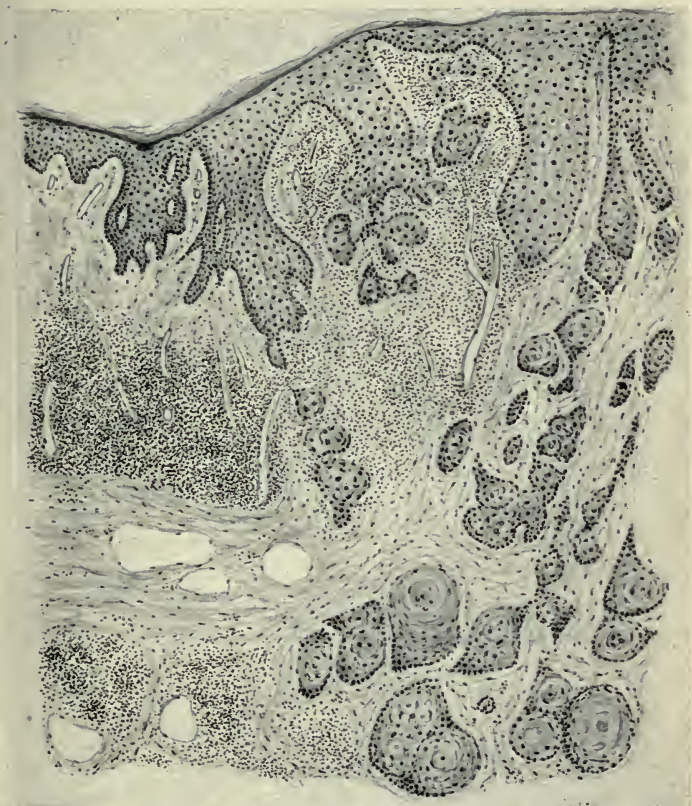
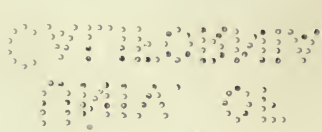


FIG. 84.—Squamous Epithelioma of Vulva.



through the cervix and may pass into the vagina, the cervix closing down on the pedicle after the tumour has emerged completely. In such cases the gradual protrusion of the tumour takes place by virtue of the muscular contraction of the uterus. In rare cases the region of uterine wall, to which the pedicle is attached, may be invaginated inwards to cause an inversion of the uterus. This displacement may continue until in the worst cases the uterus becomes turned completely inside out.

Fibroids of Cervix (Fig. 88).—Fibromyomata are less common in the cervix than in the body of the uterus. If they are submucous, they may bulge into the cervical canal or the vagina by a broad base, or they may project into the vagina as polypi. If they grow to any considerable size they soon reach the peritoneum. Under this they may burrow, becoming retroperitoneal.

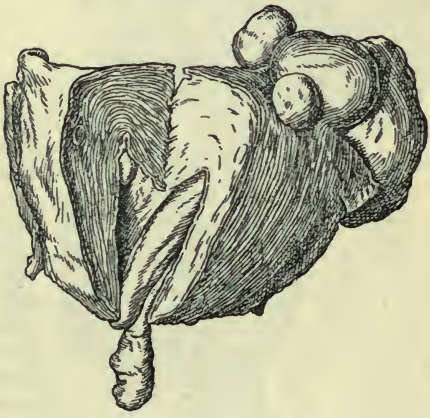


FIG. 86.—Fibroids of uterus.

As cervical fibroids increase in size they do not so easily rise into the abdomen as fibroids growing from the uterine body. They tend rather to remain in the pelvis, and, after a time, they may completely fill the pelvic cavity and cause symptoms due to pressure on the pelvic organs and structures. After a time the upper surface of such a tumour grows upwards above the pelvic brim. It lifts the body of the uterus on its back into the abdomen, and this may be felt easily, on palpation, perched on the summit or side of the tumour with the broad ligaments and ovaries on either side (Fig. 89).

Microscopic Characters.—Under the microscope a fibromyoma is seen to consist of strands of unstriped muscle fibres

collected into bundles, which are embedded in and supported by fibrous tissue. Special stains are necessary to bring out the distinctive features of the two constituent elements (Fig. 91).

FIG. 87.—Fibroids of uterus.

a, Tumour showing advanced hyaline degeneration.

The **complications** to which fibromyomata are subject are (1) Torsion, (2) Degeneration.

TORSION OF FIBROMYOMATA

The most common condition is a **twisting of the pedicle** of a pedunculated fibroid, a process very similar in its nature to torsion of the pedicle of an ovarian tumour. In fibroids it is a comparatively rare complication. If it occurs acutely, the tumour becomes swollen and congested from obstruction to the veins, and there may be haemorrhages into its substance. If the torsion is so complete as to involve the arteries, complete strangulation occurs, ending in gangrene. In either case the symptoms are usually so severe as to necessitate immediate surgical removal. The congested and strangled tumour, if not removed early, quickly becomes adherent to surrounding structures, and may become infected from the bowel (Fig. 90).

If the torsion of the pedicle occurs slowly, the congestion

and adhesions develop insidiously. The uterine blood supply becomes more and more cut off, but the adhesions round the surface of the tumour become gradually vascularised. It thus sometimes happens that, when the ordinary supply has been completely obliterated and the pedicle has perhaps shrivelled out of existence, the tumour lives on the adventitious supply traversing the adhesions. Such tumours are called *parasitic*.

The other condition of torsion is very rare. Here the **whole uterus,** which is the seat of fibroid growths, becomes twisted round a longitudinal axis, the rotation occurring round the cervix or the vagina. In acute cases there is strangulation, with rapid swelling, congestion, and haemorrhage of the uterine wall, and there may be haemorrhage from the vagina.

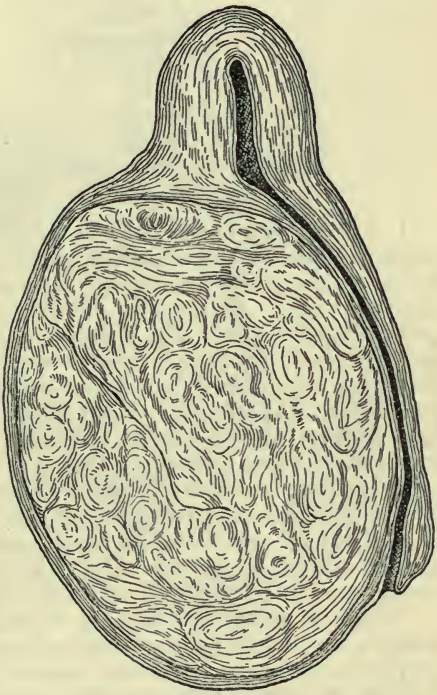


Fig. 88.—Fibroid of cervix.

Degenerative Changes in Fibromyomata

Fibroid tumours are particularly prone to degenerative changes. Except in the case of malignant degeneration, the most common underlying cause of the changes is the poverty of their blood supply. In its growth the density of the tissue

tends to shut off the supply to the central parts of the tumour, and it thus happens that degenerative phenomena are commoner in the interior of the neoplasm than on the surface. Many of the degenerations occur at or about the menopause.

The degenerations are :

1. Atrophic.
2. Inflammatory.
3. Hyaline.
4. Red.
5. Cystic.
6. Fatty.
7. Calcareous.
8. Malignant.

1. **Atrophy** of a fibroid occurs not infrequently at the menopause as an accompaniment of the general retrogressive changes of the uterus which occur then. A small fibroid may shrink until it is no longer palpable. Larger tumours may become perceptibly smaller. Any symptoms due to pressure, such as discomfort and pain, become lessened as a rule and may disappear. It should be remembered, however, that it occasionally happens that the shrinkage leads to an aggravation of symptoms. A tumour which was previously free in the abdomen becomes so reduced that it is forced down into the pelvis and initiates symptoms due to pressure on the bladder, rectum, and the other pelvic structures.

Atrophy is said occasionally to occur secondary to the involution which follows labour. So, it may be induced therapeutically by the application of X-rays or radium.

2. **Inflammation** of a fibroid is uncommon. It is especially liable to occur in submucous tumours and more particularly in polypoidal tumours. As these become extruded farther and farther, the blood supply in the pedicle is apt to become blocked. The tumour then undergoes necrotic changes and is readily infected from the vagina. Swelling and breaking-down occur, accompanied by a foul discharge. The stink associated with such sloughing fibroids is so pervading that the patient is a source of great discomfort to herself and annoyance to her friends. The only other condition which produces this symptom in the same degree is cancer of the cervix.

Other rarer causes of inflammation of a fibroid are infection at labour or abortion, torsion of a pedunculated subserous fibroid, and infection spreading from some abdominal organ, *e.g.* appendix.

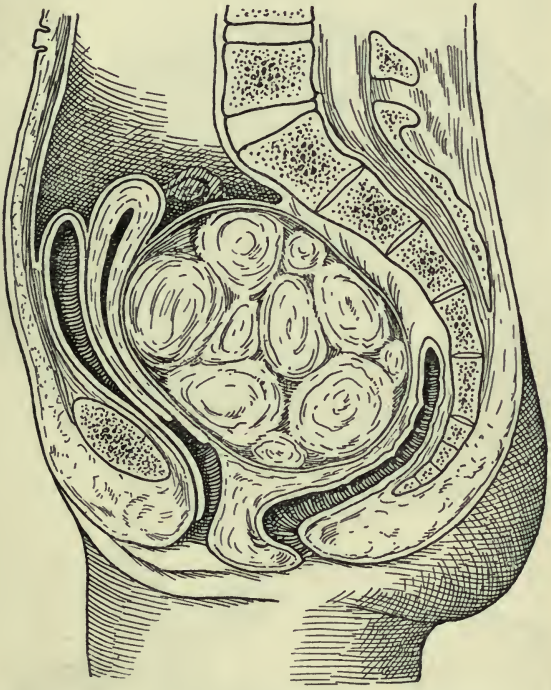


Fig. 89.—Cervical fibroid blocking the pelvis and lifting the pelvic organs into the abdomen.

3. **Hyaline Degeneration** (Fig. 87), sometimes called mucoid degeneration, is a change due to impoverished blood supply. Areas of softening occur in the centre of the tumour. The tissue elements become swollen, the cell structure disappears, and adjacent cells flow together to form a glass-like or hyaline material as seen under the microscope. The muscular elements

share in the process, and, liquefaction occurring, small cystic spaces develop, filled with a whitish putty-like matter. If

FIG. 90.—Subperitoneal fibroid which is twisted on its neck. Note omental adhesions.

numerous, the tumour may present a honeycombed appearance. Fusion may later result in the formation of larger spaces.

4. **Red Degeneration** or **Necrobiosis** is similar, if not identical,

Fig. 91.—Fibroid of Uterus—microscopic structure.

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in its origin to the above change. Massive necrosis occurs in the tumour, which may become softened throughout its substance. Here the involvement of the blood supply would seem to be a more universal and a more sudden process, for the condition often develops with great rapidity. It is then associated with a rapid increase in the tumour and severe pain. Red degeneration is specially apt to occur during pregnancy.

On section the tumour, in whole or part, is stained a deep red colour and it exhales a sickly odour. The staining is due to haemoglobin, and it seems that the change is due to necrosis occurring in a tumour more richly provided with blood than is the usual condition. Haemolysis accompanies or follows the necrotic change, and the liberated haemoglobin diffuses throughout the tumour.

5. **Cystic Degeneration** may be secondary to hyaline or necrobiotic degeneration. The cystic spaces are usually irregular in outline, and may be localised or scattered throughout the tumour, producing a honeycombed appearance. The contents in the beginning are whitish and pulpy in consistence. Later they become more watery. Sometimes they have a greenish-yellow colour.

It is said that cystic spaces may be formed by distension of lymphatic vessels, in which case the spaces possess an endothelial lining. Cavities filled with blood are occasionally found in fibroids due to a sinus-like expansion of blood-vessels (Fig. 92).

In cases of adenomyoma, the gland-elements sometimes distend to form cysts lined by epithelium. These may be single or multiple. The appearance on section suggests a cystic degeneration in a fibromyoma, and it is not until a microscopic examination is made that the nature of the condition is revealed (see Adenomyoma).

6. **Fatty Degeneration** in the form of scattered deposits of fat on the surface or throughout the tumour are not uncommon, especially towards the menopause.

7. **Calcareous Degeneration** is found not uncommonly in old dense tumours in women at or after the menopause. It is often associated with fatty degeneration. The deposit of lime may be in the form of nodules or plaques on the surface or scattered throughout the substance of the tumour. In

advanced cases the whole tumour may become petrified to form the so-called " womb-stone " of the older writers.

8. **Malignant Degeneration,** if occurring primarily in the tumour, is of the nature of *sarcoma*. This occurs in 1 to 2 per cent of fibromyomata. The sarcomatous area softens and, unless examined under the microscope, may be mistaken for

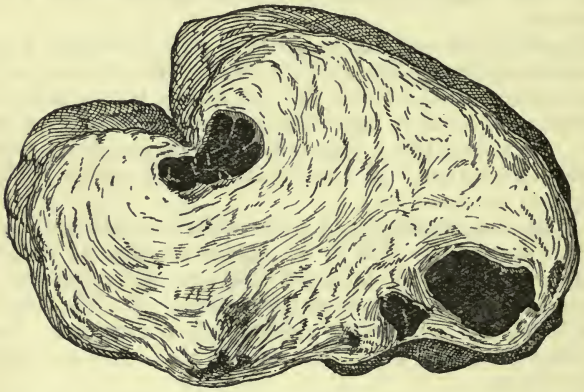

FIG. 92.—Fibroid tumour exhibiting cystic spaces filled with blood.

a local necrosis or hyaline degeneration. Recurrent fibroids, *i.e.* submucous growths that recur after removal, are probably actually sarcomatous in nature or they are bordering on malignancy.

Carcinoma does not occur primarily in a fibroid. Where a nodule of cancer is found it is due to spread from a cancerous cervix or endometrium. It is a rare complication.

CHAPTER XXV

FIBROIDS OF UTERUS (*continued*)

CLINICAL FEATURES OF FIBROMYOMATA

Age of Incidence.—Fibromyomata occur more especially in women between the ages of 35 and 45. They may be found before these years. They are rare under 30. They never originate before puberty, and they rarely if ever originate after the menopause.

Symptoms

It should be remembered that fibroids are frequently unassociated with symptoms. A woman may have even a large tumour and be unaware of its existence, until its excessive size, or some other symptom, such as haemorrhage or pain, demands attention. An important clinical fact in this connection is the **slowness of growth** of fibromyomata. In this respect they are distinguished from ovarian cysts, where the growth is typically much more rapid.

The subserous fibroid is more likely to be symptomless in the beginning than the submucous tumour, and the tumour which reaches a comparatively large size before being noticed is always of the former variety.

Increasing size of the abdomen is very often the first and may remain throughout the only symptom. The patient sooner or later complains of discomfort, though she may only be concerned because of the increasing size of her figure. For a long time she usually considers it as due to obesity. Eventually the hardness of the swelling rouses her suspicion. Rapid increase in a fibroid signifies a degenerative change.

Haemorrhage.—Of all the symptoms this is the most characteristic. It is most marked in submucous tumours, in which the loss of blood may be excessive. In a typical case it commences as a *menorrhagia*, gradually increasing from month to month. Eventually an intermenstrual loss—*metrorrhagia*—develops. In aggravated cases the loss of blood may be almost continuous.

The amount of blood-loss is, in general terms, independent of the size of the tumour. A very large subserous tumour may be unassociated with this symptom, whereas even a small polypoidal submucous tumour, no larger than a grape, may provoke a dangerous bleeding. The bleeding is accompanied by clots.

The excessive blood-loss is due to the increased vascularity of the uterus which accompanies the neoplasm, and to the increased area of endometrium present in the case of submucous tumours. Degenerative changes aggravate the bleeding.

The repeated losses, if these are severe, soon cause anaemia, which, in aggravated cases, may be extreme, associated with great pallor, shortness of breath, etc. Fatal bleeding is rare.

Fibromyomata associated with bleeding often *retard the establishment of the menopause.* Instead of ceasing to menstruate at 45 or 50, the woman may continue to menstruate or to bleed excessively till the age of 55 or even longer.

Haemorrhage from a fibroid only rarely develops after the menopause is well established, when it is due to degenerative changes.

Leucorrhoea of the nature of a watery or white discharge is sometimes found. In sloughing submucous tumours there is the escape of a copious foul-smelling discharge.

Reproductive Symptoms.—*Dyspareunia* may be present in the case of polypi which occupy the vagina.

Sterility is usual, though a fibroid uterus may conceive. Pregnancy in association with fibroids will be discussed in a later paragraph.

Pain is uncommon in fibroids. This is a fact of clinical importance and helps to distinguish fibroids as a class from other types of abdominal tumour. It means degeneration, torsion, or pressure on the pelvic structures.

In *acute torsion* the pain and tenderness may be sudden and severe, and the presence of vomiting, rigidity of the abdominal

wall, rapid pulse, and shock, may all simulate some acute abdominal crisis such as ruptured appendix, ruptured gastric ulcer, biliary or renal colic, ruptured tubal pregnancy, etc. The symptoms are also similar to those present in torsion of the pedicle of an ovarian cyst. In *slow torsion* recurring and intermittent pains accompany the adhesive peritonitis that is present.

Pressure Symptoms are more common in fibroids which occupy the pelvis in whole or part, and are specially characteristic of tumours growing from the cervix or lower part of the body (Fig. 89). As they expand they come to fill the pelvis, sometimes very tightly, and their expansion is attended with *pain, difficulty or frequency in micturition*, and *constipation*. Sometimes the compression symptoms develop suddenly, after strain or in association with the congestion of menstruation. It sometimes happens that, in a fibroid not quite big enough of itself to cause compression, the extra increase in size attendant on the menstrual process may cause acute impaction with dysuria or retention. This symptom may recur each month, passing off as the menstrual congestion subsides.

General Symptoms.— *Anaemia, dyspepsia*, and other secondary symptoms may develop as the result of the haemorrhage or pressure.

Physical Signs

In some cases there may be no physical signs. Small submucous fibromyomata may cause no palpable enlargement of the uterus.

Enlargement of the uterus is the chief physical sign of fibroids. In submucous and interstitial tumours the enlargement may be uniform. In most cases, however, the tumour growth causes an irregular and bossed expansion of the uterus, and the density of the tumour masses leaves no doubt of their nature. In ordinary cases the uterus is occupied by a number of rounded masses of different sizes so that the contour is markedly asymmetrical. The individual masses are firm, even hard to the touch, though, in the event of degenerative changes being present, one or more of the tumours may soften and, if cystic, may actually give a thrill.

An important point on examination is the recognition of

attachment of the tumour or tumours to the uterus. In most cases this is clear on bimanual examination. A pedunculated subserous fibroid may, however, move freely on its stalk apart from the uterus and, if this is not enlarged by other fibroid growths, the diagnosis may be difficult.

Small fibroids are pelvic, and tumours which grow from the cervix tend to remain in the pelvis even after they have reached a considerable size. On vaginal examination, in such cases, the tumour is found pressing down on the pelvic floor and filling up the pelvic cavity.

Polypoidal submucous tumours tend to be extruded and may bulge open the cervix and come into the vagina, where they are felt on vaginal examination. As they emerge the cervix becomes dilated and one then feels the rounded lower pole of the solid tumour presenting through the stretched os. After its complete emergence, the rounded mass is felt in the vagina, and, if it is not too big, the examining fingers can feel above it the cervix again closed round its narrow stalk.

When large, fibroids are **felt on abdominal examination.** The largest tumours may rise as high as the xiphisternum and bulge as a rounded or irregular projection in the abdomen. If the projection is of regular contour it may suggest pregnancy or ovarian cyst. Usually, however, the lateral slope of the tumour is more abrupt than in either of these two conditions.

The entire tumour may be above the pelvic brim, and in such a case the edge of the hand can be passed freely under the lower pole. Not infrequently, however, part of the growth remains in the pelvis, and this may be recognised both on abdominal and vaginal examination.

The **cervix** may show no changes. In the case of submucous polypoidal tumours it dilates as the tumour emerges into the vagina. In tumours growing from the cervix the latter may be stretched over the enlarging tumour and the os may then become a mere transverse slit. Larger tumours of cervical origin tend to remain entirely pelvic for a considerable time. Their position prevents the free expansion into the abdomen which is characteristic of corporeal tumours. They grow rather downwards and laterally at first and are felt on vaginal examination as low-lying tumours. As they expand still further their upper pole rises beyond the pelvic brim and lifts the uterine body into the abdomen (Fig. 89). This is then

felt on abdominal and bimanual examination riding freely on the summit of the pelvic tumour and at first may be mistaken for a small knob of tumour. The broad ligaments are lifted upwards at the same time and may be palpated, as also the ovaries, in the abdomen.

In such cases the cervix is displaced upwards and the external os is lifted further and further upwards behind the pubis, where it may be difficult to reach on vaginal examination.

Differential Diagnosis

The conditions most commonly confused with fibromyomata are pregnancy and ovarian tumour, and cancer of the uterus.

In **pregnancy** amenorrhoea is present, whereas in fibroids, if the menstrual function is altered, it is in the direction of menorrhagia. It should be remembered that pregnancy may complicate fibroids, in which case amenorrhoea will usually be present. The tumour in pregnancy is rounded, symmetrical, and intermittent contractions of the uterine muscle are felt on examination. In fibroids the tumour may be uniform and symmetrical, but it is usually irregular and eccentric and, except in the presence of degeneration, it has a dense consistence. Later the characteristic signs of pregnancy, the foetal heart, ballottement, etc., make the diagnosis clear. It should be remembered that a uterine souffle may be elicited in the case of fibroids, as in pregnancy. In both cases it is dependent on the presence of large veins in the broad ligament or uterine wall. If pressed on by the stethoscope the rush of the blood through the narrowed part of the vessel is heard.

In **ovarian tumour** the rate of growth is more rapid usually than in fibromyomata and there is no history of menstrual excess. The tumour if cystic will usually give the thrill sign and, unlike a fibroid, it is free from the uterus. In solid ovarian tumours, which often present an irregular bossing of their surface, the diagnosis may be difficult. Such tumours are especially difficult to distinguish from stalked subserous fibroids.

Cancer is a source of confusion, because the characteristic and earliest symptom of this condition is haemorrhage, just as in fibromyomata. The age incidence of the two conditions corresponds closely. In cervical cancer vaginal examination

reveals the condition present, though here a sloughing fibroid polypus may readily be mistaken for the fungating surface of cancer. In cancer of the body there may be an enlargement of the womb suggesting submucous fibromyoma. In all cases of doubt, curettage is demanded, followed by a microscopic examination of the uterine scrapings.

Other causes of uterine haemorrhage, abortion or retained fragments of placenta, chronic endometritis, chronic metritis, mucous polypi, sarcoma and chorionepithelioma, may all require to be considered in arriving at a diagnosis.

Other forms of pelvic swelling may cause confusion. An inflammatory mass formed round an inflamed tube, especially if it is adherent to the uterus, may closely resemble a solid tumour. The diagnosis may be obscured further by the fact that chronic infection of the tubes and ovaries is often associated with uterine haemorrhage. Here the preceding history of infection at labour or by gonorrhoea will help. Inflammatory swellings, unlike fibroids, have pain and tenderness as a characteristic feature.

Treatment of Fibromyoma

Many fibromyomata require no treatment. If unassociated with symptoms, and merely found in the course of an examination for some other condition, they will probably require no more than periodic observation, so that any possible degenerative change in the future may be recognised. Symptomless subserous fibroids and fibroids in a post-menopausal uterus will ordinarily require no treatment. Whilst these are the general rules advised for the reader's guidance, it is well to mention that there are some gynecologists who recommend operation in every case.

In the following conditions removal should be carried out :

1. *Severe haemorrhage*, laying the patient off work every month.
2. When symptoms due to *pressure* in the pelvis or abdomen develop.
3. *Degeneration* of the tumour as seen in rapidity of its growth, pain or excessive haemorrhage.
4. *Torsion.*

Palliative Treatment.—In cases where the symptoms are mild, where the patient refuses operation, or where some contra-indication to operation, such as cardiac disease, exists, non-operative treatment is necessary. Towards the menopause a case, which would at an earlier period of life demand operative removal, may sometimes safely be left in the hope that the atrophy of the menopause will arrest the symptoms. Such

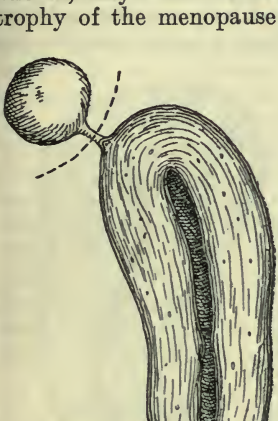

FIG. 93.—Removal of stalked subperitoneal fibroid.

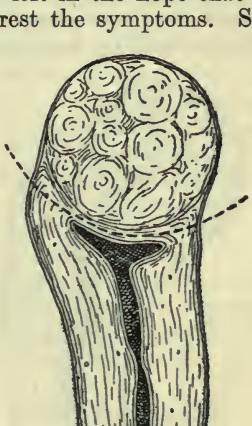

FIG. 94.—Myomectomy for sessile subperitoneal fibroid.

cases are guided over the intervening months by suitable palliative measures.

The best palliative treatment for haemorrhage is *rest* in bed, with the administration of a *uterine styptic*, such as ergot. Rest is often helpful in cases of pain and in relieving pressure symptoms.

X-rays or radium constitute a useful method of non-operative treatment. Their employment may lead to a shrinkage of the tumour and to a diminution or disappearance of the symptoms, especially haemorrhage. Their action is twofold. The rays operate directly on the tumour by killing the young

cells, and indirectly by their sterilising influence on the ovaries, which thus leads to a premature menopause. Ray treatment should not be employed where complications are present, such as degeneration and incarceration. Removal is indicated then.

Operative Treatment.—The extent of the interference required varies in different cases within wide limits (Figs. 93-96). In some the fibroid may be removed from the uterus by conservative surgery, leaving a functioning organ behind. Such

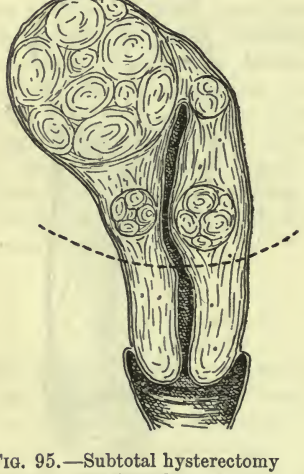

FIG. 95.—Subtotal hysterectomy for fibroids.

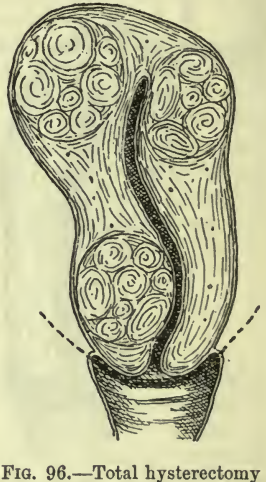

FIG. 96.—Total hysterectomy for fibroids.

is the treatment in submucous polypoidal fibroids and in some cases of fibroids growing in the outer surface of the uterus.

Submucous Polypoidal Fibromyomata.—If the tumour projects through the cervix it is enough to seize it with a strong volsellum forceps. It is pulled down and a curved pair of scissors is passed over its surface to divide the neck across. The divided neck slips back into the uterus and soon shrinks. Sometimes it is necessary to dilate the cervix or even to split open the cervix (hysterectomy) in order to reach a submucous tumour which is situated within the uterine cavity.

Small subserous tumours may be removed by *myomectomy*.

Here the abdomen is opened. Stalked tumours are easily removed after ligaturing their neck. Sessile tumours may be shelled out through an incision across their surface. This method is only available in the case of single or, at the most, two sessile growths. Removal of more than two tumours is apt to mutilate the uterus too much, with the consequent risks of haemorrhage and sepsis. Myomectomy is a method especially to be considered in young women who desire pregnancy. It is associated with slightly greater risks than hysterectomy and is never justified at or after the menopause.

In the great number of cases operation consists of removal of the uterus in whole (*total hysterectomy*) or at the level of the isthmus (*subtotal hysterectomy*). Where the tumours involve the cervix, and in all cases where malignant disease is suspected, total hysterectomy is required. Where only the body is involved, supravaginal hysterectomy is carried out.

The operation is carried out through an abdominal incision, though sometimes in the case of small fibroids the hysterectomy may be done through the vagina. The details of the various operations will be discussed in a later chapter.

FIBROMYOMA COMPLICATING PREGNANCY

Fibromyomata constitute an important cause of sterility in women over 35. By some it is believed, on the other hand, that a barren uterus is more prone to the growth of this class of tumour than a uterus whose activities are engaged normally in reproduction.

A fibromyomatous uterus may become pregnant. This risk is greatest in subserous tumours and least in submucous tumours, though it is by no means uncommon to find the membranes or even placenta adherent to the surface of a submucous growth.

The complication may give rise to no symptoms whatever, and it not infrequently happens that a subserous tumour in the uterus is discovered for the first time after labour, which may have terminated without any untoward incident. In other cases symptoms due to the complication make their appearance during pregnancy and may cause abortion or premature labour, or a tumour in the pelvis may be first discovered when it is found obstructing the birth of the child.

The **symptoms and signs** present are, in general terms, those of pregnancy modified in certain directions by the presence of the neoplasm. The bladder irritability common in early pregnancy may be exaggerated. So may the morning sickness. Amenorrhoea may be completely established, or there may be intermittent attacks of haemorrhage. This may mask the existence of the pregnancy.

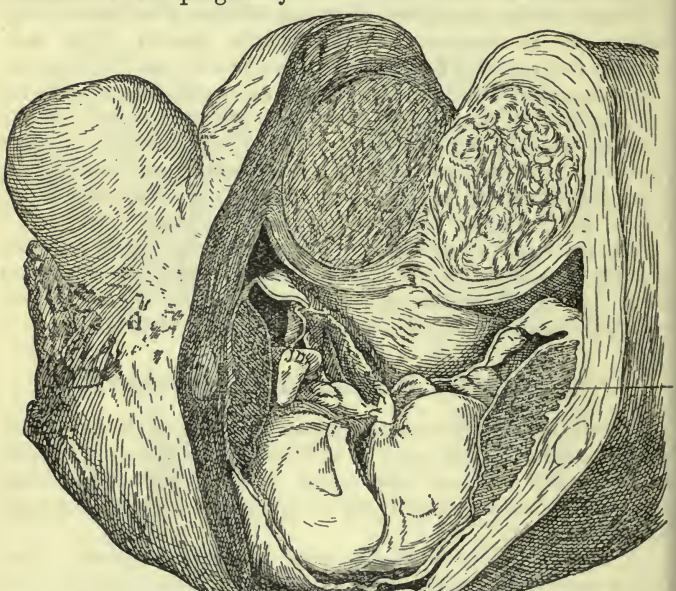

Fig. 97.—Pregnancy in fibroid uterus.

The size of the uterus is an important sign. In tumours of appreciable size, the pregnant uterus is, from an early stage, seen to be larger than it should be, in proportion to the duration of the pregnancy. Moreover, the asymmetry of the uterus, and the presence in one part of a solid growth, whilst the remainder of the womb is softened and boggy, are valuable indications.

The **complications** of this condition are liable to appear

either during pregnancy, during labour, or after labour. *During pregnancy* the occurrence of haemorrhage or degeneration or the pressure of the tumour may provoke abortion or premature labour. Red degeneration, often rapid in its onset and development, and associated with acute symptoms, is especially prone to occur during pregnancy.

During labour a tumour may obstruct birth (Fig. 98). Tumours which are high up in the uterus, and which are subserous, may remain above the child and cause no trouble. Tumours of the cervix, if of any size, of necessity impose an insuperable barrier, so also tumours growing low down in the body or stalked tumours, which drop into the pelvis in front of the head. The possible effects of this obstruction are discussed in obstetrical text-books. They are inertia uteri, and uterine rupture.

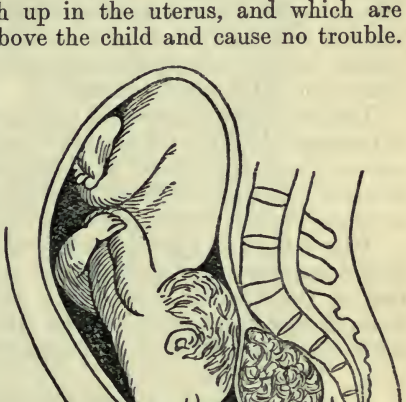

FIG. 98.—Fibroid of cervix obstructing labour.

After labour, also, there is the risk of post-partum haemorrhage, especially in the case of a submucous tumour. A tumour damaged during labour may degenerate and become infected, with all the risks attendant on puerperal infection.

The **treatment** consists in the careful watching of the patient during her pregnancy. If degeneration intervenes, enucleation of the tumour may be feasible. More often hysterectomy is demanded. If the child is viable, Caesarean section will first be carried out. In cases where the tumour is in the cervix or low down in the body and its site implies inevitable obstruction to the birth, it is well to carry out a Caesarean section near full time. Then a myomectomy or hysterectomy, according to the condition present, is carried out.

During labour the treatment depends upon the circumstances present. If the tumour is free of the pelvis, labour may be unimpeded, and the attendant's duties then consist merely of watchful supervision. Sometimes a growth that tends to block the passage of the child can be pushed upward out of the way, after which the labour is ended by forceps as soon as there is sufficient dilatation of the cervix. Occasionally it happens that a cervical fibroid becomes spontaneously uplifted from the pelvis, as the cervix during its dilatation is pulled further and further upwards over the head by the retraction of the uterine muscle.

The treatment required for a patient first seen in the throes of obstructed labour will depend on circumstances. Caesarean section plus myomectomy or hysterectomy may be necessary. In other cases, especially if there is the least risk of infection having occurred, craniotomy may be the wiser procedure.

After labour no special treatment may be called for unless such complications as post-partum haemorrhage, or degeneration of the tumour occur. The former is treated as laid down in obstetric text-books, the latter may demand hysterectomy in the early days of the puerperium.

ADENOMYOMA

As the name implies, an adenomyoma is a tumour, which contains glandular elements in addition to those of a myoma. The term should in reality be adenofibromyoma, for the bulk of the tumour consists of fibrous and muscular elements, similar in their arrangement to that obtaining in a fibromyoma. The naked-eye appearances of the tumour are so like fibromyoma, that, for a long time, the two conditions were confused. In many cases it is impossible to make a distinction without a microscopic examination.

As a rule, however, the adenomyoma differs from the fibromyoma in being a *diffuse* tumour. It is not circumscribed in the form of a solid ball, the usual condition in fibromyoma ; its outlines pass imperceptibly into the adjacent tissues. This makes a naked-eye distinction possible. Under the *microscope* the glandular elements are seen to be scattered throughout in the form of aggregations of tubules lined by a columnar epithelium. The tubules are embedded in a cellular stroma.

FIG. 99.—Adenomyoma.

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In histological appearance the glandular structures look like little packets of endometrium (Fig. 99).

Adenomyomata are simple tumours.

Sites.—(1) The commonest site is the *uterus*. (2) The *recto-vaginal septum*. Here the growth infiltrates the area between rectum and vagina. It may burrow on to the vaginal surface in the form of papillae, which bleed. (3) The *round ligament*. If it grows from the anterior end of the round ligament it may form a swelling felt in the groin. (4) *Broad*, and (5) *ovarian* ligaments.

The *origin* of the glandular elements in the tumour has been the object of a good deal of discussion, with which it is unnecessary to weary the reader. In the case of uterine growths they are almost certainly derived from the uterine mucosa. In the extra-uterine sites they may be derived from aberrant fragments of Müllerian or Wolffian tissue.

Symptoms and Signs.—These are the same as those of fibromyomata, in so far as the uterine growths are concerned. The recto-vaginal growth may bleed into the vagina or rectum. In some cases it causes a narrowing of the bowel lumen.

Treatment.—This is as for fibromyoma.

CHAPTER XXVI

POLYPI OF UTERUS

THE following types of polypi are found in the uterus :

1. Mucous or adenomatous.
2. Nabothian.
3. Fibroid.
4. Placental.
5. Malignant.

Mucous Polypus.—This may be found growing either from the mucous membrane of the body or the mucous membrane of the cervix. Sometimes they are found springing from both sites in the same patient.

The *etiology* in the majority of cases is a *chronic inflammation* of the endometrium of the body or cervix. On a preceding page (p. 148) it has been stated that localised polypoidal projections of mucosa are common accompaniments of chronic glandular endometritis. It is said, also, that these polypi may be *new growths* of the nature of adenomata.

Pathology.—They may be single or multiple. They commonly consist of finger-like or globular swellings, which rarely grow larger than a cherry, attached to the lining membrane of the uterus by a narrow neck. The surface is pale and glistening, as a rule. There is a tendency for the neck to become lengthened, when the little rounded growth may come to project through the external os into the vagina. Sometimes they reach the vulvar orifice. In such cases the stretching of the neck leads to an obstruction of the vessels and the polypus becomes congested and purple.

Mucous polypi are not infrequently removed by curettage, when the growths are recognised by their more or less rounded contour and by the fact that they have a complete epithelial

covering, as contrasted with the ragged fragments of mucosa, in which they are embedded.

Microscopically the mass of the polypus is seen to consist of the same elements as the mucosa, corporeal or cervical, from which they are derived. The blood-vessels are usually expanded, and there is usually a marked increase in number of glands, the tubules of which are often dilated.

Symptoms.—The chief symptoms are (1) haemorrhage and (2) leucorrhoea. It should be remembered that, in most cases, the symptoms are probably as much due to the chronic inflammatory changes in body or cervix as to the polypi.

Signs.—Where the polypi project through the external os as soft, rounded, cherry-like growths the diagnosis is easy. Otherwise, the condition is usually only revealed during the examination of the scrapings of the mucosa removed by curettage.

Treatment.—If projecting from the cervix, they are seized with forceps after the patient has been placed in the lithotomy position and a posterior speculum has been inserted. The polypi are easily twisted off. It is well to curette the uterus at the same time.

Nabothian Polypus.—This is a Nabothian cyst of the cervix, which has become loosened, and dangles from the vaginal portion by a narrow pedicle. They may be single or multiple, and their origin is a chronic cervicitis of which Nabothian cysts are an evidence. Of themselves these little polypi cause no symptoms. They are dealt with in the course of the treatment of the cervical catarrh (p. 144).

Fibroid polypus has already been fully discussed in the chapter dealing with fibromyoma. It consists of a submucous fibromyoma, which has become polypoidal.

Placental Polypus.—In the puerperium, if a piece of placenta remains adherent to the uterine wall, a large swelling may develop by the deposit of blood in increasing laminae over the surface of the placental fragment. The solid thrombus thus formed may distend the uterus and bulge at its lower end through the cervix. The chief symptom is excessive lochial haemorrhage, with a swinging of the temperature, which subsides after the uterus is cleared out.

Sometimes a piece of placenta may remain in the uterus, fixed and living, for many weeks or months, and the coagula-

tion of blood round it may give rise to a distinct polypoidal swelling (Fig. 100). The symptom in such cases is *haemorrhage* —menorrhagia and metrorrhagia—which is persistent and intractable, till the uterus is cleared out with the curette.

Malignant Polypus.—In some cases a mucous polypus may become malignant, the connective-tissue stroma becoming sarcomatous or the epithelium becoming carcinomatous. These changes are probably rarely present, though it is notorious how frequently the pathologist finds difficulty in pronouncing whether the tissue changes in such cases are due to chronic inflammation or malignancy.

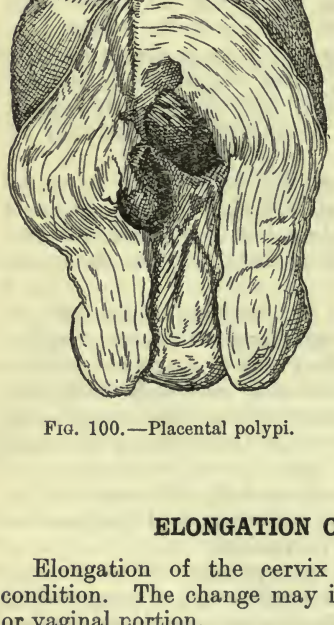

FIG. 100.—Placental polypi.

Malignant degeneration may, likewise, occur in submucous fibroid polypi. The majority of malignant polypi, however, occur as localised overgrowths into the cavity of the uterus or vagina of sarcomatous or epitheliomatous new growths. They will, therefore, receive attention in the chapter devoted to the discussion of these subjects.

ELONGATION OF THE CERVIX

Elongation of the cervix is a comparatively common condition. The change may involve either the supravaginal or vaginal portion.

Supravaginal Elongation.—This is the commoner variety. It is usually associated with prolapse, when, as we have seen (Fig. 101), it is caused by a mechanical stretching out of the cervix in its long axis. During prolapse the anterior vaginal wall, as it is driven further and further down by the intra-abdominal pressure, pulls down the cervix, the point of traction being where vagina is attached to cervix. If the uterine body

is well slung up by its ligaments it tends to resist the effort from below to pull it down, and, although it usually sinks down to some extent, the stretching action lengthens the supravaginal cervix more and more. As this part of the cervix lengthens it becomes thinned out and one may find it reduced considerably in diameter. A certain amount of hypertrophy of a compensatory nature may accompany the process. Sometimes the condition is called "hypertrophic elongation," but it is evident that if the above description of its origin be correct, it is dependent more on a mechanical stretching than on an overgrowth.

It should be mentioned that some writers consider that the elongation of the cervix in prolapse is primary and is to be considered as the cause of the prolapse.

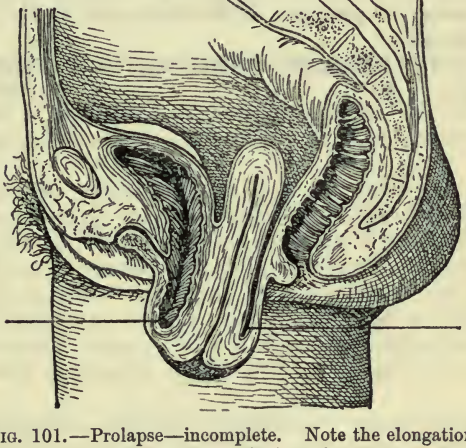

FIG. 101.—Prolapse—incomplete. Note the elongation of the supravaginal cervix.
1. Bladder. 2. Pouch of Douglas.

Supravaginal elongation is *diagnosed* on examination by the low position of the cervix in the vagina, the walls of which are evaginated over it, whilst on bimanual examination the uterine body is at its ordinary level in the pelvis, or, if at a lower level, its position is such that a mere descent of the uterus as a whole does not explain the downward protrusion of cervix.

Vaginal Elongation.—This is a comparatively rare condition. It is usually congenital, and, unlike supravaginal elongation, which is found in parous women, it is found in virgins and in nulliparae. It may be associated with prolapse and it is by some believed to be the usual cause of the rare cases of prolapse in virgins and in nulliparae.

This condition is a true hypertrophy, the overgrowth involving the fibro-muscular wall of the cervix chiefly.

It is recognised by the same physical signs as denote a supravaginal elongation, though in elongation affecting the vaginal portion, unless there is an associated prolapse, the vaginal cavity is not shortened. In some instances the hypertrophied cervix is so long that it comes down and projects at the vulvar orifice.

This condition has to be distinguished from the chronic inflammatory thickening of the exposed vaginal portion which occurs in prolapse, and which is a purely secondary phenomenon.

The **treatment** of elongation of the cervix is amputation (see p. 295).

CHAPTER XXVII

SARCOMA OF UTERUS

This is a rare tumour. As compared with cancer of the womb it is very rare indeed.

Etiology.—This is unknown. Child-bearing has an important predisposing influence. 75 per cent of the patients are parous.

Pathology.—Sarcoma usually originates in the centre of a *fibroid tumour* as a softening, yellow or whitish nodule. Sarcomatous degeneration of a fibromyoma occurs in 1 to 2 per cent of cases. It is associated in some cases with a rapid enlargement of the tumour. As a rule, however, sarcoma is only recognised during a routine examination of fibroid tumours after removal. Sarcoma thus arising may be spindle-celled, which is the commoner (Fig. 103), round-celled, or mixed-celled.

Submucous polypoidal fibroids occasionally recur after removal, though microscopic examination may show no evidence of malignancy. After several such removals, the tumour may finally show sarcomatous changes. Such recurring tumours are sometimes called *recurrent fibroids*.

Sarcoma may originate in the connective tissue of the muscle or mucosa of cervix or body. *Sarcoma of the endometrium* is usually a round-celled tumour spreading diffusely over the inner surface of the uterus (Fig. 102). It may project in the form of polypoidal masses into the uterine cavity. Such cases are occasionally associated with inversion of the uterus. *Sarcoma of the muscular wall* of the uterus growing independently of a fibroid tumour is non-capsulated. *Sarcoma of the cervix* in rare cases assumes the form of a grape-like cluster of growths projecting into the vagina.

Wherever they occur, sarcomata are soft masses of a yellow or yellowish-white colour. They are characteristically riddled with areas of haemorrhage and not infrequently show hyaline or cystic degeneration.

If they spread in front they may invade the bladder, whilst the rectum may be infiltrated behind. Secondary spread to the tubes and ovaries and peritoneum may occur. In such

Fig. 102.—Sarcoma of uterus.

cases solid ovarian tumours develop and the involvement of the peritoneum causes ascites. So, metastases are comparatively common in sarcoma. They are commoner than in cancer of the uterus.

In rare cases sarcoma of the uterus is associated with carcinoma uteri.

Symptoms.—Sarcoma uteri may occur *in children*, where it is associated with a bleeding discharge from the vagina.

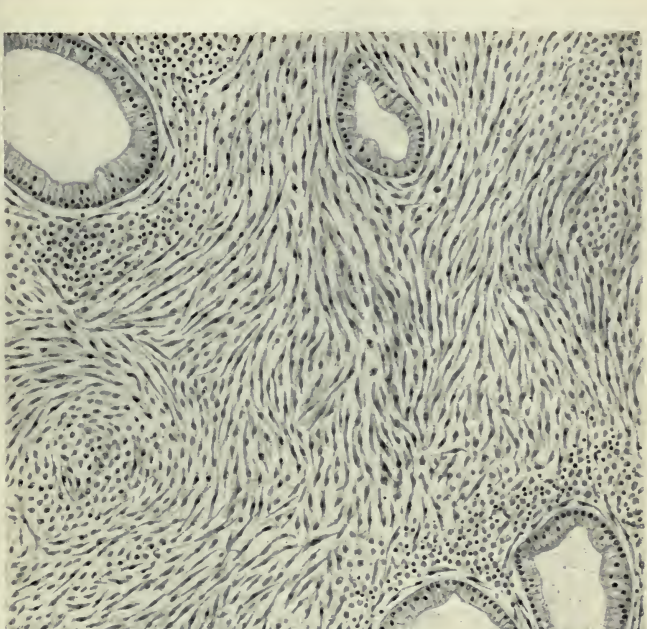

FIG. 103.—Spindle-celled Sarcoma of the Endometrium.

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Before puberty such a symptom should cause grave anxiety. Pain is usually an early symptom in such cases.

In older women, sarcoma is difficult to distinguish from carcinoma. The symptoms are identical—vaginal haemorrhage, leucorrhoea, which becomes foul, and pain. The growth in sarcoma is usually more rapid and the symptoms are correspondingly more aggravated.

Ascites and abdominal pain and tenderness occur with ovarian and peritoneal involvement.

Sarcomatous degeneration in a fibroid causes, as a rule, rapid enlargement of the tumour, with pain, and, in some cases, increase in the haemorrhage.

Spread to the bladder will give the symptoms of cystitis. Fistula formation is rare in sarcoma.

Signs.—There may be no evidence of the condition, and the malignancy may be revealed only after the removal of a fibroid. In other cases the tumour may be palpably softened and tender to the touch before removal. Ovarian secondary growths may be palpable on abdominal examination, and the abdominal swelling of ascites may be felt.

Bimanually the uterus may be felt to be the seat of fibromyomatous growths. Otherwise there may be little detectable on examination except some enlargement of the uterine body. If the cervix is involved, the friable growth, which bleeds on being scraped with the finger, will closely simulate a cancer. In later cases the invasion of the surrounding structures produces a mass which envelops the uterus and which is adherent to the pelvic wall.

Differential Diagnosis.—The chief conditions which sarcoma uteri has to be distinguished from, are *fibromyoma* and *carcinoma*. Where the uterus is fibromyomatous, a sudden enlargement with tenderness may denote malignancy. It may, however, only mean some simple degeneration. The diagnosis can, therefore, only be made after removal. To distinguish from carcinoma, curettage is necessary. The physical signs and symptoms of the two conditions may be identical.

Curettage, also, differentiates it from *other causes of haemorrhage*, chronic endometritis, chronic metritis, mucous polypi, retained placenta, and chorionepithelioma.

Treatment.—The uterus and the appendages are extirpated completely by an abdominal operation.

CHAPTER XXVIII

CARCINOMA OF UTERUS

THIS may occur in cervix or body. The former site is about fifty times more frequent than the latter. In rare cases carcinoma and sarcoma of the uterus occur together.

CARCINOMA OF CERVIX

ETIOLOGY

Multiparous women are more prone to cancer of the cervix than nulliparae in the proportion of about 12 to 1. Laceration of the cervix and *chronic inflammation* following labour are probably the chief predisposing factors. It is said that carcinoma may follow *erosion* of the cervix.

Age is an important factor. The majority of cases occur between 40 and 50. The incidence diminishes progressively under 40 and over 50. It is rare under 30.

PATHOLOGY

Cervical cancer may arise either from the squamous epithelium which covers the outer aspect of the vaginal portion—squamous epithelioma; or it may grow from the columnar epithelium covering the surface and lining the glands of the mucosa of the cervical canal—columnar-celled carcinoma (Fig. 104).

Squamous epithelioma is the commoner variety. The early growth occurs as a warty excrescence projecting into the vaginal vault, as a hard nodule or as an ulcer. In the beginning it is localised to one small area, but with time it infiltrates

the surrounding tissues and eventually leads to a diffuse thickening of the vaginal portion of the cervix and overflows on to the adjacent vagina. Destruction of tissue and ulceration accompany the proliferation, and this is aggravated by infection with septic organisms, which is an early phenomenon. The surface of the ulcerated area is friable, and it breaks away easily and bleeds on examination or other interference, such as coitus. When infection has occurred a copious foetid discharge escapes from the surface.

The destructive ulceration occurs on the surface, the proliferation in the deeper places, so that, as the tissues break away superficially, the cancer extends in widening circles centrifugally. In the course of time it thus happens that the vaginal portion of the cervix may be completely destroyed, and the vaginal vault is represented by a ragged and foul crater-like cavity surrounded by dense tissue (Fig. 105).

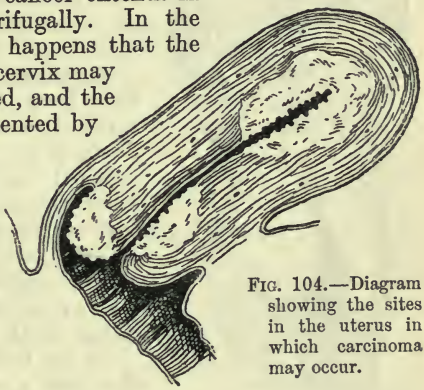

FIG. 104.—Diagram showing the sites in the uterus in which carcinoma may occur.

Squamous epithelioma tends to flow over on to the **vagina** comparatively early. Sooner or later, too, the connective tissue embracing the cervix (**parametrium**) becomes invaded by the solid growth. The adjacent viscera become involved. If the spread is in front, the **bladder** is infiltrated. Cystitis develops, and, in later stages, destruction of tissue leads to the formation of a fistula between vagina and bladder (vesico-vaginal fistula).

The **ureter** may likewise be infiltrated, resulting in obstruction, with the production of hydronephrosis. **Infection of the urinary tract** may spread to the kidney or kidneys, causing pyelonephritis. Bilateral blockage of the ureters may cause suppression and uraemia.

Where the line of growth is backwards the *rectum* may be involved, and, in later stages, a recto-vaginal fistula may be produced.

Spread to the **lymphatic glands** is comparatively late in cancer arising from the vaginal aspect of the cervix.

Microscopically, squamous epithelioma of the cervix has the general appearances presented by this type of growth in other parts of the body. There are solid plugs of polyhedral cells growing into the subjacent tissues, which reproduce the characters of the cells from which they are derived. Keratinisation of the epithelium is uncommon in the cervix, and cell-nests are, therefore, not so typical here as in squamous epithelioma growing in other sites—*e.g.* the skin (Fig. 106).

FIG. 105.—Carcinoma of cervix.

Columnar-celled Carcinoma develops from the epithelium of the cervical canal. It may arise low down in the cervix, and, where the cervical lips are spread apart by laceration, and the lining mucosa is exposed in the vaginal vault (ectropion), the cancer may arise on the exposed vaginal surface. Or it may originate in the concealed part of the canal.

In the former site it may exactly simulate a squamous epithelioma growing from the vaginal portion. In the latter site it remains shut in during a considerable period of its growth, and an advanced cancer may be present with no evident alteration in the shape or size of the cervix.

As in cancer of the vaginal portion, the intracervical cancer may bulge into the canal in the form of papillary growths, or it may from the beginning be ulcerative. In either case destruction of tissue occurs, though, as infection is not so ready to occur here as in an exposed cancer, the destructive process may be slower. As before, extension into the fibromuscular tissue of the cervix leads to a thickening and expansion of the outer wall of the cervix. This may be associated

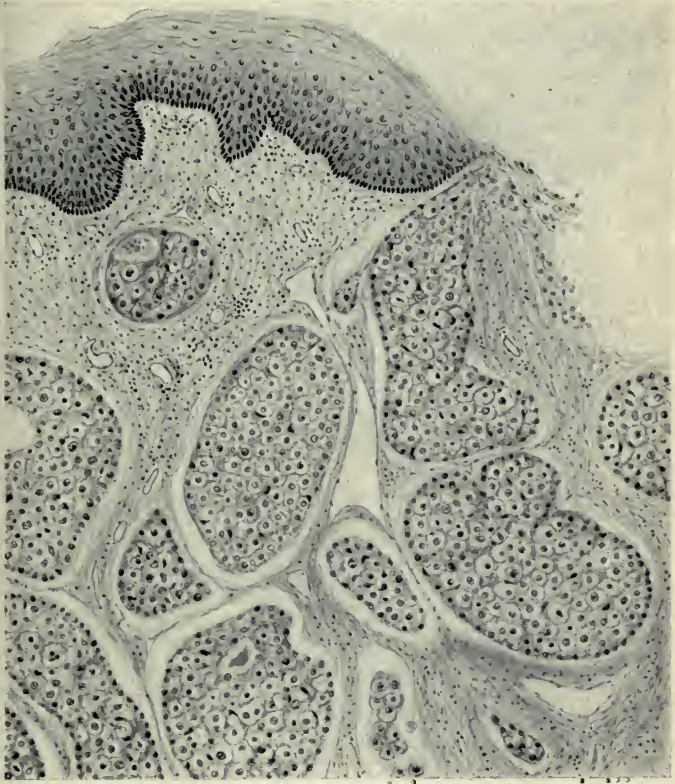

FIG. 106.—Squamous Epithelioma of Cervix.

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with a crater-like cavity of destruction round a considerable area within the canal.

Extension upwards into the body of the uterus is not uncommon. The cervical growth may block the lumen above, and infective discharges accumulating in the uterus, produce a **pyometra** (Fig. 107). Infection may traverse the uterus to the tubes and ovaries causing **a septic salpingo-oöphoritis.**

As in cancer of the vaginal portion, an outward spread to the **parametrium, bladder, ureter,** and **rectum** may occur. Extension to the **lymphatic glands** is relatively early in this type, a fact which renders the prognosis after operation more gloomy than in cancer of the vaginal portion. The glands which are involved are: (1) the gland which lies where the ureter crosses the uterine vessels; (2) the iliac glands on the external iliac vessels; (3) the hypogastric glands between the external and internal iliac vessels; and later (4) the sacral and (5) lumbar glands.

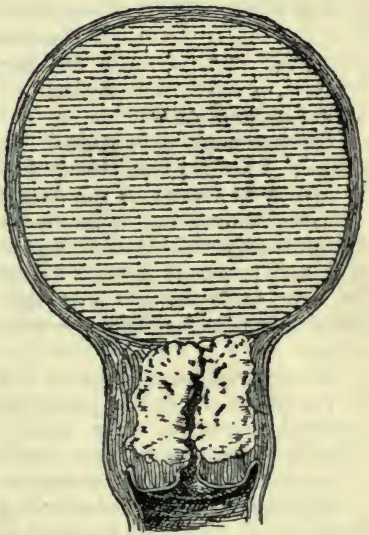

FIG. 107.—Carcinoma of cervix and pyometra.

Microscopically columnar-celled carcinoma occurs as two kinds: (*a*) *adeno-carcinoma.* Here the epithelial cells in their growth retain their acinar arrangement. (*b*) *Medullary carcinoma.* Here the acini become lost in whole or part, and the cells proliferate in the form of solid masses, which closely resemble squamous epithelioma. With this it is easily confused, and in advanced cases of cervical cancer it is often impossible to tell by microscopic examination the exact site of origin. The medullary and acinar types may be combined in the same specimen (Fig. 109).

In old women the cancer may be *scirrhus*. Here the amount of connective tissue present is large, and the epithelium is scanty. This type is slow growing and relatively benign.

Metastases are relatively rare in uterine cancer. They may occur in the liver, spleen, lungs, bones, etc.

Symptoms

The three cardinal symptoms of carcinoma are :

1. Haemorrhage,
2. Discharge,
3. Pain,

in the order named.

Haemorrhage occurs from the superficial destruction of tissue. Like the foul leucorrhoeal discharge it is an earlier symptom in cancer of the vaginal portion than in concealed cancer of the cervix. The reasons for this are that the exposed cancer is more liable to infection and trauma. Digital examination and coitus both tend to induce bleeding in early cases. In later cases the haemorrhage may be almost continuous, causing severe anaemia and exhaustion. Fatal haemorrhage is rare.

Haemorrhage as a symptom in a woman over 40 *should always be considered as due to malignant disease until this has been positively excluded. The recurrence of vaginal haemorrhage after the menopause has been established for some months or years is practically always due to cancer.*

The **discharge** in the beginning is of the nature of a watery leucorrhoea. Later it becomes very foul, with a stink that is far reaching. It is blood-stained from an early stage.

Pain is a comparatively late symptom. The cervix itself is peculiarly insensitive and, so long as the growth is limited to it, there is an absence of pain. This symptom does not arise till a spread occurs on to the vagina, into the parametric tissue, or to the surrounding organs, bladder and rectum. *The onset of pain, therefore, means as a rule that the condition has spread beyond the scope of removal.*

It thus happens that cancer of the cervix is only rarely seen in a condition which allows of complete removal. The late onset of the pain, which first brings the patient for advice, is an important reason for this tragic fact. Another coincident

factor is that the maximum incidence occurs in women over 40, and the irregular bleeding, which is the first definite signal of the condition, is usually believed by the patient and her friends to denote the imminence of the menopause. It is a mistaken idea amongst women of all classes that irregular and excessive haemorrhage commonly precedes the menopausal arrest of menstruation.

The other symptoms depend on the involvement of the adjacent organs. Cystitis is associated with *pain* and *frequency of micturition*, and fistulous formation with *incontinence* of urine. In the later stages this is often a very distressing symptom, and the natural discomfort and annoyance is aggravated by the *irritation of the vulva and thighs* caused by the infected urine. *Uraemia* may develop from blocked ureters or *septic absorption*, with fever and kidney pain, from infection of the renal organs.

The constant drain on the patient's tissues from haemorrhage and discharge sooner or later cause increasing *loss of weight*. In the beginning, and in some cases throughout a considerable course of the disease, the loss of weight may not be appreciable, and a patient with an advanced cancer of the cervix may enjoy good general health.

Physical Signs

As general signs *anaemia* and *emaciation* may betray the existence of some deep-seated disease.

The only convincing sign of carcinoma is the evidence of the **microscope**, and this, the ultimate test, must be employed in every case. In early cases, on vaginal examination, there may be nothing felt except a local **induration** or **roughening**, or a **wart-like elevation** on the outer surface of the vaginal portion of the cervix. The tissue is **friable** on the surface and crumbles, if scraped with the finger-nail. If concealed within the cervix there may be no detectable enlargement or other change in the cervix even up to a late stage.

Cervical cancer, however, is rarely found in the early stage. By the time examination is made the vaginal portion is deeply infiltrated and indurated, one lip or side being often more involved than the rest of the tissues. The cervix may be enlarged to several times its normal size. The surface is

ulcerated and irregular and, if scraped with the finger-nail, it crumbles so that small fragments of tissue and blood are carried away on the finger. Such fragments are sufficient for a microscopic examination. *Thickening, induration, and friability are three cardinal signs.*

In later stages the whole vaginal portion is removed by destruction, and a ragged crater is felt in the vaginal vault, dipping all round into the hardened tissue. The growth may be felt overspreading the vagina and sinking deeply into the connective tissue round the cervix and vaginal vault and extending to the side of the pelvis.

The uterus eventually becomes embedded in solid growth and becomes fixed or only partly mobile.

In intracervical cancer, if the disease has spread into the fibromuscular wall of the cervix, a localised dense swelling may be felt in the supravaginal part of the cervix. When the confines of the cervix are broken through, destruction of tissue may result in the same crateriform cavity in the vaginal vault as occurs, at an earlier stage, in cancer growing from the exposed vaginal cervix. So, extension takes place through the parametrial connective tissue towards the bladder, the rectum, and the side walls of the pelvis. This extension is felt as an indurated mass surrounding and fixing cervix and uterus.

Differential Diagnosis

Excessive haemorrhage from the vagina may be due to cancer, fibroids, abortion or retained products of conception, chronic endometritis, mucous polypi, chronic metritis, and rarer forms of malignant disease, such as sarcoma and chorion-epithelioma. Still more rarely tuberculosis of cervix or uterine body may cause the same symptoms.

The age of the patient is of some help in diagnosis. In young women haemorrhage is in the large proportion of cases due to pregnancy or retained placental fragments. Added to these, between 25 and 35, chronic inflammatory conditions become increasingly operative. After 35, fibromyomata begin to operate as a causal factor. It is in the years over 40, when inflammatory conditions, fibroids, and malignant disease all constitute important causes of haemorrhage, that the greatest difficulties in diagnosis arise.

FIG. 108.—Microscopic appearances of the Uterine Decidua.

In many cases it is impossible to clear up the diagnosis even after a careful bimanual examination. In all cases the only absolute test is the microscope. In a cancer exposed in the vaginal vault a piece of tissue is removed by finger or scissors. In a concealed cancer the curette is used and the removal of a large quantity of soft, pulpy, and pale material rouses a suspicion that is confirmed by the microscope.

Short of microscopic examination, the diagnosis becomes clear in many cases by a consideration of the history and the physical signs. In **fibromyoma** there is usually a long-standing history of bleeding gradually increasing in intensity. The duration of the symptoms over a period of years, and the discovery of a solid circumscribed tumour or tumours in the uterine wall makes the distinction clear.

Submucous fibroids are more likely to cause confusion than subserous or interstitial tumours. They are more likely to cause haemorrhage and, if bulging through the cervix as a rounded hard growth, or, more especially, if they have become strangulated and form a sloughing mass in the vagina, the diagnosis at first may be difficult to those of little gynecological experience. In such sloughing tumours the haemorrhage and foul discharge may closely simulate cancer. On careful vaginal examination, however, the rounded circumscribed tumour is felt to be free of the cervix which simply encircles it. It should be remembered that malignant disease may accompany fibromyoma.

In the haemorrhage due to **pregnancy,** the bleeding is of recent origin and there is usually a history of preceding amenorrhoea. With abortion the blood escape is associated with recurring pains in the back. Examination reveals the presence of the large soft uterus and the patulous external os, with perhaps part of the foetus or placenta bulging.

Retained fragments of placenta may keep up a long-standing menorrhagia and metrorrhagia. The fact that the symptoms date from a previous labour or abortion helps to distinguish the condition, as also the removal of gestation products or decidua with the curette (Fig. 108).

Chronic inflammatory conditions, such as endometritis or metritis, are usually devoid of any marked physical signs, such as uterine enlargement. The history of infection at labour or, failing that, the discovery that the condition dates from the

last labour or abortion, or from an attack of gonorrhoea, help in the diagnosis.

Mucous polypi are recognised pouting through the cervix, or they are discovered in the curetting scrapings.

Sarcoma and chorionepithelioma can only be excluded by microscopic examination. In the latter case suspicion may be aroused, if the haemorrhage dated from a pregnancy complicated by hydatidiform degeneration of the chorion.

Erosion, tuberculosis, and syphilitic gumma in the cervix may simulate cancer.

In **erosion** there may be enlargement and chronic thickening and induration. But there is no friability, and on examination through a speculum the characteristic signs of erosion are visible. Sometimes the diagnosis may be obscure, and, moreover, cancer may succeed erosion. In all cases of doubt a microscopic examination is necessary.

In **tuberculosis,** and also in **syphilitic gumma,** the cervix may be the seat of a localised growth suspiciously like cancer—indurated, ulcerated, and friable. Microscopic examination is necessary.

Prognosis

Cancer of the uterus is fatal within one to two years in the majority of cases. Some patients survive even to seven years. Radical operation in an early case gives a fair chance of recovery.

Treatment

Radical removal of the uterus and tubes and ovaries, with a dissecting extirpation of the surrounding tissue, is the only method which provides a chance of recovery. The operation carried out is the complete operation associated with the name of Wertheim.

Indications of Operability.—In deciding on the line of treatment, the surgeon must satisfy himself as to whether the disease is operable or non-operable. *Fixation of the uterus* is the test applied. If the uterus is freely mobile—*i.e.* if the disease has not spread beyond the cervix to the vagina and the parametric tissue, the case may be freely tackled by operation. If partly fixed by some vaginal extension and some infiltra-

FIG. 109.—Adeno-Carcinoma of Uterus.

tion of the connective tissue it may still be removed by dissection. If quite fixed by massive infiltration of the vagina, parametric tissue, and, more especially, if bladder and rectum are invaded, the case is inoperable.

It should be remembered that fixation of the womb may be due to the inflammatory exudate which is laid down in front of the cancerous growth all round, and a case which seems inoperable may be really removable. This is often a matter of great difficulty to decide and may only be determined by operation.

Such operations as amputation of the cervix and vaginal hysterectomy, which were employed in former days, are no longer justified. It is only by a free dissection, which is possible alone by the abdominal route, that the patient is given the best chance of recovery.

Treatment of Inoperable Cases.—*X-rays* and *radium* are the best means of controlling the haemorrhage and sepsis. In many cases the application of the ray treatment heals up the ulcerated area in the vaginal vault, which may cicatrise, though the disease advances at a higher level. By some gynecologists ray treatment, given before the complete hysterectomy operation, is claimed to heal up the tissues and even to cause a shrinkage of the growth so that the operation becomes easier. Some even claim that a preliminary radiation may make an inoperable case operable. Others claim that radiation after operation prevents recurrence. It is still too early for a definite opinion to be expressed on these questions.

Curettage of the diseased area and the application of strong caustics may help in cleaning up the septic surface and in diminishing haemorrhage for a time.

Sedatives are necessary for pain in the later stages.

CANCER OF THE BODY

This is much less frequent than cancer of the cervix, the proportion being about 1 to 50.

Etiology

This is unknown. The question of labour does not operate here so strongly as in cancer of the cervix, for cancer of the

body is about as common in nullipara as in multipara. Age is an important factor. It occurs rarely before the menopause. It occurs chiefly in women over 50.

Pathology

The cancer arises from the epithelium lining the glands or covering the surface of the corporeal mucous membrane. The most common type is **adenocarcinoma,** in which the malignant cells are arranged round the lumina of the glands (Fig. 109). The malign nature of the growth as contrasted with the benign proliferation of a chronic glandular endometritis may only be confirmed by finding that the tumour cells are invading the muscular wall of the uterus (Fig. 109). In most cases, however, the malignancy is abundantly apparent, for the cells proliferate so rapidly that they extend outwards as solid masses into the surrounding stroma or they fill up the gland spaces which then become changed into solid plugs of cells (Fig. 109). Where solid masses are thus produced the condition may simulate an ordinary carcinoma or a squamous epithelioma. A true **squamous epithelioma** may occur in the corpus uteri, where it is usually derived from an upward spread of a cervical cancer. It may, however, commence primarily in the corpus, being preceded by a metaplasia of columnar into squamous epithelium.

In the early stages there is a localised overgrowth of mucosa, which bulges into the uterine cavity. At the same time on its deeper aspect the growth infiltrates and destroys the muscle. Spreading laterally the disease invades adjacent mucosa, until the whole inner surface of the uterus is occupied by a soft, thick, pulpy lining (Fig. 110). In some cases there are polypoidal or villous tufts projecting into and distending the uterine cavity. The progressive infiltration of the muscular wall leads to an expansion of the uterus. In some cases the increase in the size of the uterus is appreciable and it may be considerable. Not infrequently, especially where a cancer develops in the atrophied uterus of an elderly virgin, the uterus may be small, though the disease has reached an advanced stage.

Lymphatic involvement is not a prominent feature in most cases. If the cancer grows low in the uterus the same glands

are involved as in carcinoma cervicis, namely the iliac and hypogastric. If high in the uterus the lumbar glands and, rarely, the inguinal glands may be enlarged. The latter are involved *via* the round ligament.

In later stages the disease spreads beyond the confines of the uterus into the *parametric tissue* and may invade *bladder*

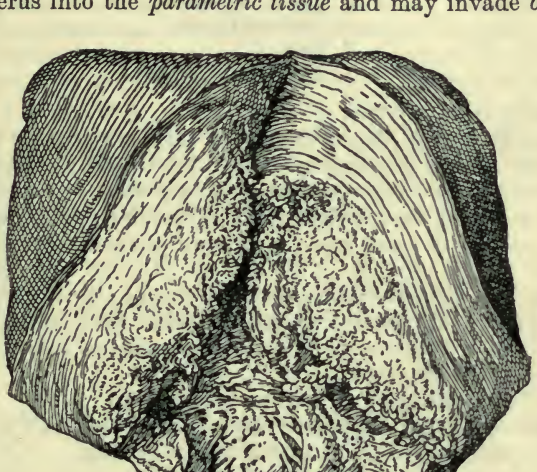

FIG. 110.—Carcinoma of uterine body.

and *rectum*. The womb finally becomes fixed in a mass of pelvic cancer.

Infection is a later phenomenon as a rule than in cervical cancer. The result is that septic discharge is not so early and the haemorrhage not so persistent in nature. When it occurs, the progress of the disease is hastened and the case is then apt to be complicated by salpingo-oöphoritis, cystitis, pyelonephritis and even by peritonitis.

Metastatic deposits may occur in the liver, lungs, bone, and other tissues.

Symptoms

The three cardinal symptoms are the same as for carcinoma cervicis, though their order of development is somewhat different. They are :

1. Haemorrhage,
2. Pain,
3. Foul Discharge,

appearing in that order.

Haemorrhage.—This is usually an early symptom. It may commence as a bleeding gradually increasing in degree, or there may be, to begin with, a sudden gush of blood followed by intermittent haemorrhages. The bleeding commences in a large number of cases some months or years after the menopause.

Pain is earlier here than in cervical cancer and it is probably dependent upon painful uterine spasm. Pain in the later stages is due to involvement of the parametric tissue, tubes, ovaries, peritoneum, etc.

Foul discharge may be late in developing.

Other symptoms depend on the salpingo-oöphoritis, cystitis, pyelonephritis, peritonitis, or metastatic growths.

Signs

Corporeal cancer in the atrophic postmenopausal uterus, especially of a virgin, may be associated with a very small shrivelled uterus.

Usually, however, a large heavy uterine body is felt. Later, bimanual examination reveals the uterus fixed in adhesions or surrounded by firm tumour tissue.

Anaemia and emaciation and cachexia may be prominent. On the other hand the patient may for a long time seem to enjoy good health.

Differential Diagnosis

The same questions arise here as in carcinoma cervicis. The age of maximum incidence in carcinoma corporis is greater. It is rare before the menopause, and this consideration generally

rules out such conditions as abortion and retained placental fragments.

Senile endometritis has to be distinguished. The age incidence and the general clinical features in the two conditions being similar, the microscopic examination of material scraped from the uterus alone can settle the matter. In both conditions the uterus may be enlarged or it may be atrophic.

Fibromyoma is recognised by the duration of the bleeding being such as to exclude malignancy, and by the discovery of the solid tumour or tumours of the uterus on examination. In fibromyomata haemorrhage rarely starts after the menopause. In degenerating submucous fibroids, however, the symptoms and signs may exactly simulate carcinoma corporis, and an exploration of the uterine cavity is necessary to clear up the diagnosis.

Carcinoma cervicis is recognised by the growth on the vaginal portion of the cervix. Concealed cervical cancer can often only be distinguished from corporeal cancer after exploration.

Treatment

Complete **hysterectomy with removal of tubes and ovaries** is demanded.

In inoperable cases, **X-rays** and **radium** may be used with temporary advantage. **Sedatives,** such as morphia, eventually become necessary to soothe the pain of the last weeks or months.

CHAPTER XXIX

CHORIONEPITHELIOMA

This is a rare tumour of the uterus.

Etiology

The tumour consists of tissue of a malignant nature derived from chorionic elements and, *in the uterus*, which is its practically invariable site, a preceding pregnancy is, therefore, the source of the condition. The pregnancy may have ended in abortion or full-time labour, a piece of placenta having been left behind in either case. In the majority, however, the cause is a portion of a hydatidiform mole (Fig. 115), which has remained behind in the uterus after the expulsion of the great mass of the degenerated chorion. In some moles, even before expulsion, the chorion elements are known to have become malignant. Such malignant moles differ from the simple mole in the excessive proliferation of epithelium which they exhibit, and in the deeper erosion or even perforation of the uterine wall by the expanded villi.

Rarely, the tumour may occur in the *Fallopian tube*, coming on after tubal pregnancy.

Still more rarely a new growth of similar characters may develop in the male *testicle*, and it has also been described in the *mediastinum*, as a primary tumour. In these unusual sites it may have a teratomatous origin.

Pathology

Naked Eye Appearances.—The tumour occurs in the form of solid nodules of a deep purple or red colour mottled with pale areas. This appearance is due to the fact that the tumour elements are embedded in blood clot or surrounded by large

blood sacs, in which there may be a certain degree of circulation going on. The tumour masses may be single or multiple, projecting on the inner surface of the uterus, or situated within the muscular wall of the uterus, which they have reached by erosion or by migration along the blood-vessels. They may erode to the peritoneal surface (Fig. 111).

The malignant chorionic elements show the same tendency as the normal chorionic epithelium to *travel into and along the blood channels*. This fact explains the haemorrhage, and it explains the mode of spread, which may occur to long distances

FIG. 111.—Chorionepithelioma of uterus. Note the secondary deposit in the broad ligament and the multiple cysts in the ovary.

along the ovarian and uterine veins into the broad ligaments and connective tissue of the pelvis.

Venous extensions may occur down to the *vagina*, where secondary bleeding masses of tumour may be found.

Metastatic deposits occur, likewise, as the result of embolic deportation along the veins and occur especially in the lungs.

The tendency to haemorrhage, which is so characteristic of this type of tumour, may result in the malignant masses becoming strangled by the bleeding, which they provoke. This results in the spontaneous cure which occurs in a small proportion of cases.

Microscopic Appearances.—The tumour reproduces the general features of the normal chorionic epithelium. The foetal villus is covered by two layers : (1) an inner, consisting of one

or more strata of polyhedral cells—*Langhans* layer, and (2) an outer, consisting of soft masses of multinucleated protoplasm —*Syncytium*. In chorionepithelioma these two cellular elements occur in irregular masses surrounded by blood (Figs. 112-115).

Changes in Ovaries.—In chorionepithelioma, as in hydatidiform degeneration of the chorion, the ovaries often exhibit an interesting and peculiar degeneration. This consists in the development, usually on both sides, of a number of cysts lined by lutein tissue and filled by clear fluid. Sometimes a cluster of such cysts may lead to marked enlargement of the ovary (Fig. 111).

Symptoms

Persistent or repeated uterine **haemorrhage** following abortion, full time labour, or hydatid mole is the chief symptom. In these the bleeding may, of course, be simply due to the retention of a fragment of mole or placenta with no malign properties. Following hydatid mole it is, however, to be regarded with grave suspicion. Curettage usually cures a simple case. It leaves a case of chorionepithelioma generally worse or only temporarily benefited.

Anaemia may be extreme as the result of the excessive blood loss. **Pain** in the lower abdomen and small of the back may be present.

Pulmonary symptoms, pain, blood-stained sputum, and cough indicate an embolic deposit.

In rare cases spontaneous cure, with disappearance of all symptoms, may occur.

Signs

Anaemia and loss of weight are usually present in well-established cases.

Bimanually the large uterus distended by tumour may be felt. In early cases the uterus may not be obviously enlarged.

Microscopic examination of the material obtained by curettage is the only certain sign. Irregular masses of Langhans' cells and syncytium discovered in a case with suspicious symptoms should warrant a positive diagnosis. The absence of positive microscopic evidence should not be

FIG. 112.—Microscopic section of portion of a Hydatid Mole: note the distended avascular villus and the spreading mass of proliferating chorionic cells. Here and there syncytium is seen. Below is the necrotic decidua.

FIG. 113.—Chorionepithelioma—nodule of the tumour infiltrating the muscular wall of uterus.

accepted as reassuring until some months have passed without a recurrence of haemorrhage.

In advanced cases the solid plugs of tumour can be felt extending from the uterus to the side wall of the pelvis and sometimes to the vagina, and in the latter site they bleed freely on examination.

Differential Diagnosis

This is sometimes difficult. The main difficulty arises in early cases, where it is often impossible, even after curettage, to tell whether the haemorrhage is due merely to **retained products of pregnancy** of a simple nature or to chorionepithelioma. Curettage helps in cases where the microscopic examination reveals some simple placental tissue on the one hand, or definite malignant masses on the other. It helps also by causing permanent cure as a rule in one class of case, whilst the benefit in the other is only temporary.

Such conditions as **chronic endometritis, fibromyoma, cancer,** and **sarcoma** are excluded by a careful examination of the history and the signs, and the microscopic evidence derived from curettage.

Treatment

If the case is operable, a complete extirpation of uterus and appendages should be carried out. To prevent the detachment of the tumour masses which grow along the venous channels, a risk which may occur during manipulation, the ovarian and uterine vessels should be ligated as early as possible in the operation.

CHAPTER XXX

NEW GROWTHS OF THE OVARY

New growths of the ovary are somewhat difficult to classify. Certain cystic conditions have an inflammatory origin and have few of the characters of true new growth. This tendency to cyst formation we have already referred to in connection with ovarian inflammation, and some writers believe that such cysts should not be included under the heading of new growth at all. There is much to be said in favour of this view. The difficulty of making a distinction will remain, however, until it is known how far inflammation operates as a cause in the case of ordinary neoplasms. Many pathologists believe that most if not all new growths have an inflammatory origin.

New growths may develop from the epithelium or from the connective tissue of the ovary. The two broad classes of tumour are, therefore, (1) Epithelial, and (2) Connective Tissue. In addition there is a small class of tumour consisting of embryonic structures. These constitute the third class, (3) Embryonic. A classification of this sort is more natural than the usual division into simple and malignant tumours, for, as will be seen, it allows of associated types of simple and malign tumour being discussed together.

Ovarian tumours will be treated under the following heads in the subsequent pages:

A. *Epithelial Tumours*

1. Benign Cystoma.
   - (*a*) Non-proliferating—derived from the Graafian follicle. — Simple follicular. / Lutein.
   - (*b*) Proliferating — Cystadenoma. — Pseudomucinous. / Serous or papillomatous.
2. Malignant—Carcinoma.

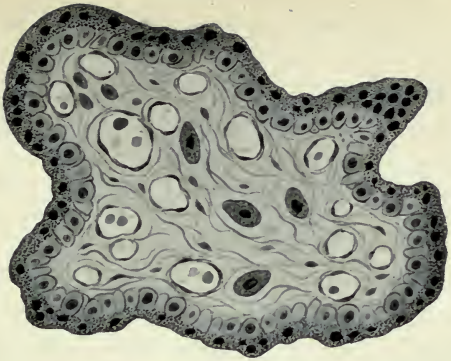

FIG. 114.—Transverse section of Chorionic Villus about the third month.

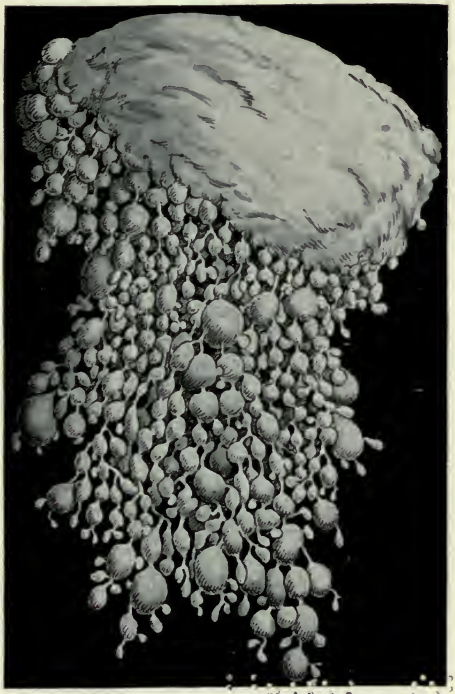

FIG. 115.—Portion of Hydatidiform Mole. (After Munro Kerr.)

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B. *Connective Tissue Tumours*

1. Benign.
   (*a*) Fibroma.
   (*b*) Fibromyoma.
2. Malignant—Sarcoma.

C. *Embryonic Tumours*

1. Benign.
   Dermoid Cyst.
2. Malignant Teratoma.

BENIGN EPITHELIAL TUMOURS OF OVARY

NON-PROLIFERATING CYSTS

This constitutes a class of cyst found frequently in the ovary. It is caused by a simple distension of the Graafian follicle. If the change occurs in an early maturing follicle it is called a *simple follicular cyst.* If it occurs in a follicle which has passed on to the formation of lutein cells in its wall, it is called a *lutein cyst.*

Simple Follicular Cysts.—Small cysts filled with clear fluid and about the size of a pea are common in the cortex of the ovary, especially towards the surface, on which they may project as blisters. They may be single or multiple and are often present in an ovary otherwise normal. Occasionally such a cyst grows to the size of an apple or even bigger, when the remainder of the ovary becomes displaced and thinned out over its surface (Figs. 116, 117).

These serous cysts are due to the gradual accumulation of liquor folliculi in follicles, which do not rupture normally—atretic follicles. The ovum is dead in such cases.

An ovary with a large follicular cyst tends to become pedunculated, when it becomes exposed to the risk of axial torsion.

By many observers it is thought that these cysts are due to an inflammatory congestion of the stroma, or to an inflammatory cirrhosis of the tunica albuginea, which prevents the normal rupture of the follicles and thus leads to their becoming expanded by the accumulating fluid. Against this is the fact that such cysts are found in the foetal ovary.

Be this as it may, a cystic distension of the follicles is common in ovaries which are embedded in inflammatory adhesions secondary to salpingitis. The whole of the ovary thus strangled may show advanced cystic degeneration. A similar fate often overtakes ovaries in which a conservative resection is attempted, and where, at a subsequent operation, the cystic ovary is found encircled by peritoneal adhesions.

Microscopically, the simple follicular cyst is lined by a cubical epithelium, which, in the larger cysts, may become flattened by pressure.

Lutein Cysts.—Here the lining membrane of the cyst contains lutein cells, which form a yellowish layer round the circumference of the swelling.

As we have seen in Chapter III., lutein cells appear in the wall of the follicle in the later stages of maturation, and before this is complete. The luteinal layer is fully formed, however, only after the normal dehiscence of the ovum. Lutein cysts develop by distension of a follicle either in the maturating or in the corpus luteum stage.

In the former or *early lutein cyst* the lutein cells are small and the yellow layer is thin. This type of cyst is sometimes called the theca- lutein cyst in contrast with the corpus luteum cyst. A distinction of this sort is ambiguous, because the luteal cells in each case are derived from the theca interna layer (see Chap. III.).

The early lutein cyst is usually single, but it may be multiple and in some cases both ovaries are involved. This class of degeneration of the ovaries is specially apt to be found in hydatidiform degeneration of the chorion and chorion-epithelioma. The cysts are then usually in both ovaries and may grow to a considerable size. Their contents consist of a clear albuminous fluid. If pedunculated, an ovary with early lutein cysts may undergo axial torsion.

Corpus luteum cysts are usually single and are bounded by a well-defined layer of luteal tissue of a bright yellow colour (Fig. 118).

Blood cysts of the ovary are not uncommon and are due to the effusion of blood into a follicle (Fig. 117). In the majority of cases the condition arises in the later stages of maturation, after the lutein cells have appeared, so that the blood cavity is bounded all round by a thin bright yellow membrane. Such

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FIG. 116.—Simple Follicular Cysts of Ovary.

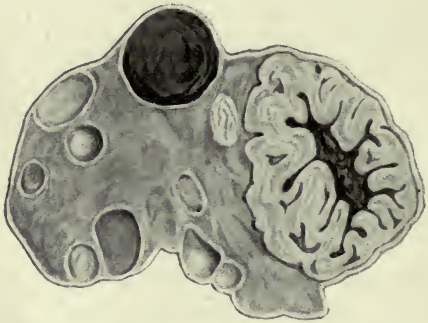

FIG. 117.—Cut section of Ovary showing :

1. Simple follicular cysts.
2. Blood cyst.
3. Corpus luteum.
4. Corpus albicans.

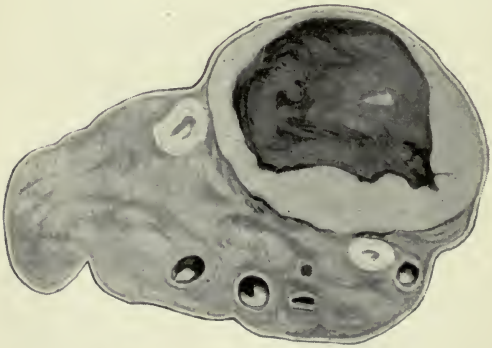

FIG. 118.—Corpus luteum Cyst.

a blood cyst would correspond in its nature very much to the early lutein cyst. In some instances a blood cyst arises in a follicle in association with the process of dehiscence. In such a case the small amount of bleeding into the follicle cavity, which normally accompanies the process of rupture, is greatly increased. These cases are sometimes, also, accompanied by intraperitoneal haemorrhage, which may cause acute pain as a symptom.

A corpus luteum may become distended by diffused blood to form a blood cyst lined by a well-defined yellowish layer, thicker than is present in the above-mentioned type of haemorrhagic cyst.

It is interesting to note that, clinically, blood cysts of the ovary are often accompanied with uterine haemorrhage—menorrhagia, and sometimes metrorrhagia.

PROLIFERATING CYSTS—CYSTADENOMATA

The exact origin of the epithelium from which an ovarian adenoma or carcinoma arises is still obscure.

The epithelial structures of the ovary are: (1) the germinal epithelium, (2) the ova, (3) the follicular epithelium, (4) the rete ovarii. These have all been described in the chapter devoted to anatomy. Developmentally, they are all believed to be derived in the beginning from downward incursions of the germ epithelium. From any one of these epithelial elements the epithelial new growths may originate. In the adult normal ovary a dipping down of the germ epithelium into the cortex, in the form of tubules, is not infrequently seen, and it is believed by some workers that it is from these epithelium-lined spaces that the cystic adenomata have their origin.

It is believed by some writers that the adenomata and carcinomata may arise from Wolffian elements embedded in the hilum of the ovary. This view is not now, however, commonly held.

There are two types of benign epithelial tumour, in both of which the epithelium is arranged so as to form glandular spaces. In both the secretion has no outlet and accumulates in the acini of the glands, which become gradually dilated to

form cystic cavities. They are, therefore, both cystic adenomata. In the substance of the tumour all stages between the simple, undilated acini up to the most fully dilated cystic cavity are found. The two types are distinguished by the character of the contents into (*a*) pseudomucinous and (*b*) serous, which are usually papillomatous.

Pseudomucinous Cyst-adenoma (Fig. 119).—This is the commonest type of tumour of the ovary. It occurs at any age, being more common in adult women.

The surface is white or bluish white in colour. It is always *multilocular* and lobulated, the number of cysts varying greatly in different cases. As a rule one or two of the loculi are much larger than the others. Thinning out of the septa between adjacent cysts may result in an amalgamation of the cavities. In such cases the remains of the septa are usually present.

The size of the loculi depends on the length of time during which the tumour has been growing, though the rate of growth varies in individual cases. In some it is rapid, in others slow. The very large cysts, which were common in the days before operation was the recognised line of treatment, are now rare. The old text-books all show the characteristic picture of the emaciated woman with, by contrast, the abdomen rising in a mountain sometimes so large that the patient veritably became an appendage to the tumour.

The loculi are distended with a *thick jelly-like substance*, which is secreted from the lining cells. It is allied to mucin, from which it differs in some chemical characters. Hence the name "pseudomucin."

The colour of the cyst contents varies from a clear transparency to a light brown. The presence of cholesterin crystals gives a greenish glistening appearance.

On rare occasions one or more of the loculi of a pseudomucinous cyst may be of the nature of a dermoid tumour.

Occasionally pseudomucinous cystomata present papillomatous growths on their surface and in their cavities, similar to the papillomata commonly found in serous cystomata.

They are usually pedunculated, the length of the pedicle being in general terms proportional to the size of the tumour. For the larger the tumour, the more it rises into the abdomen from the pelvis, and the longer the pedicle tends to become.

The *pedicle* consists of the broad ligament pulled out by the growing tumour. It has, therefore, a peritoneal investment ensheathing some fibromuscular tissue, in which the ovarian vessels run. The ovarian ligament runs in it and the Fallopian tube is often dragged along the side of the pedicle.

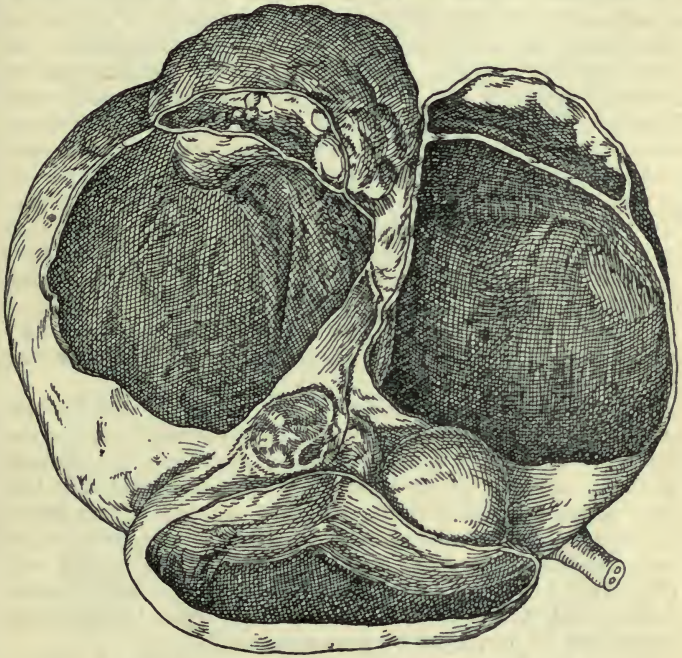

Fig. 119.—Pseudomucinous cyst-adenoma of ovary.

Pseudomucinous cysts are specially apt to suffer from *axial torsion* of their pedicle. They are more prone to this complication than any other type of ovarian tumour, and, as this class of cyst constitutes the larger proportion of neoplasms of the ovary, it follows that an operation required for axial torsion reveals the pseudomucinous tumour more commonly than any other class of tumour. The etiology and results of axial torsion are discussed on pages 256 and 257.

Rupture of a pseudomucinous cyst may occur as the result of a blow on the abdomen, a sudden strain, or spontaneously from a giving way of the wall which has thinned out to breaking point (see p. 255).

The escape of the contents of a pseudomucinous cyst into the abdomen, either by rupture within the abdomen or by misadventure during an operation for removal, is apt to be followed by the condition called *pseudo-myxoma peritonei*. In this, scattered cystic spaces filled with pseudomucinous material grow on the peritoneal surfaces of the abdomen. They are due to the engrafting of cellular fragments loosened from the ovarian tumour. As they grow they become cystic and reproduce the microscopic characters of the parent growth. Pseudomyxoma peritonei is associated with increasing ascites. The widely diffused infection of the peritoneum usually means that surgical removal is impossible. It thus happens that, though in its microscopic nature the condition is not malignant, it is clinically malignant.

Pseudomyxoma peritonei has been described as a secondary manifestation of the rare pseudomucinous cysts of the appendix.

Microscopically, the nature of the neoplasm can be best studied in a piece of tissue removed from the solid areas of the tumour. Here the undiluted gland acini can be studied. They are seen to be lined by long, thin, epithelial cells laid close together, and containing darkly staining nuclei, which lie close up against their base. Usually the secretion can be seen exuding as globules from the free surface of the cells (Fig. 120). With distension of the spaces the cells become cubical and then flattened. In the larger cysts the epithelial lining may be destroyed by pressure.

Serous or Papillomatous Cyst-adenoma (Figs. 121, 122).—This type of tumour is not so common as the pseudomucinous cyst-adenoma. It is found at any age, being more common in adult women.

It may be composed of an aggregate of cyst spaces, in which case it is multilocular like the pseudomucinous cyst, and it often resembles this class of tumour in outward appearances. As a rule, however, it presents marked features of distinction.

The serous cyst-adenomata are more characteristically *bilateral* and they do not tend to grow to the same large dimen-

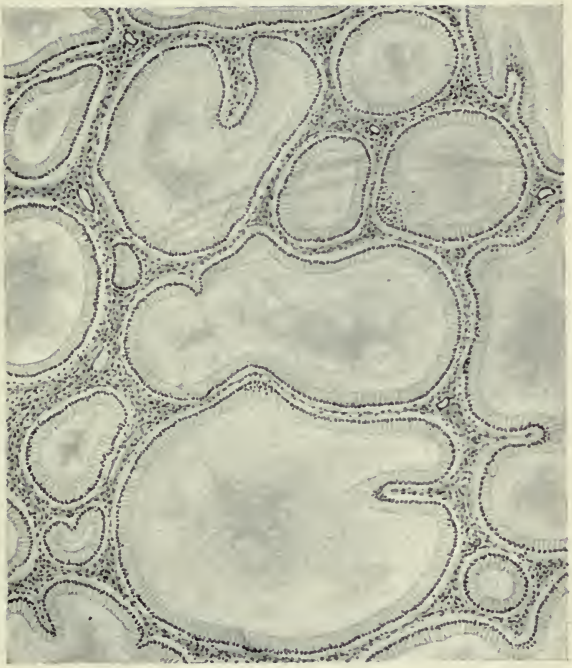

FIG. 120.—Microscopic appearances of Pseudomucinous Cyst-adenoma of Ovary.

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sions. They are occasionally unilocular. They do not show the same tendency to become pedunculated as the pseudo-mucinous cyst. Rather they incline to burrow between the layers of the broad ligament to become *sessile* tumours. The cyst contents are clear and limpid and contain *no pseudo-mucin*.

An important feature of this kind of cyst is the frequency of *papillomata*. These may grow from the lining membrane of the cyst, in which case they are concealed within the cyst cavities, or they may spring from the outer surface of the tumour. The papillomata vary from broad warty growths with a rough surface and sometimes of a firm, dense consistence, to soft villous outgrowths. They may be localised to

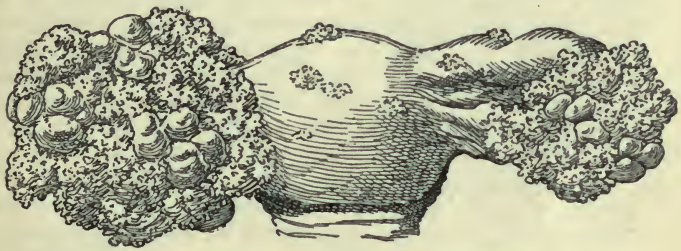

FIG. 121.—Bilateral cyst-adenoma of ovary.

an area inside or on the surface of the tumour or they may overspread a wide region.

Papillomata growing on the surface tend to spread rapidly and in a short time overflow from the ovary to the peritoneum of the tube, the uterus, the bowel, and the pelvic walls. Transmission of papillomatous ingredients may take place across the peritoneal cavity to adjacent or distant organs and, in an advanced case, practically every area of the abdomen may exhibit warty growth.

An invariable accompaniment of this condition is *ascites*, which increases with the degree of peritoneal involvement.

This tendency towards a wide transplantation of the papillomatous growths makes this class of tumour clinically malignant in the sense that it inclines to recurrence after removal and extirpation of the scattered papillomata soon

becomes surgically impossible. These manifestations of clinical malignancy are present, even when histologically the tumour is not in itself malignant. In other cases the papillomatous cyst-adenoma is cancerous from the beginning or develops the characters of carcinoma later.

In some rare cases, it should be mentioned, the removal of the parent growths in the ovary is followed by a spontaneous disappearance of the scattered nodules of secondary growth.

Microscopically the lining of the loculi of a serous cyst-adenoma consists of a cubical or columnar epithelium. The cells are not so long and thin as is the case in a pseudo-mucinous cyst.

Fig. 122.—Papillomatous cyst-adenoma of ovary. Section of growth.

The papillomata consist of a connective tissue core, covered by an epithelium similar to that lining the cysts. In the villous type the papillomata are long and feathery, and the epithelial proliferation in such cases may be very active (see Fig. 123). In some cases this may border on malignancy or be actually malignant.

In some instances the warty growths are hard and fibrous and consist of mere local elevations of connective tissue. This type of papillomata is usually intracystic and has no tendency to peritoneal transplantation.

MALIGNANT EPITHELIAL TUMOURS OF OVARY—CARCINOMA

Carcinoma of the ovary may be (1) primary or (2) secondary.

Primary Carcinoma of Ovary is less common than the simple cystic epithelial tumours. It occurs at any age, being most common between 45 and 55, but it may occur in younger women and children. It is usually *bilateral*.

It occurs in two types: (*a*) cystic and (*b*) solid.

(*a*) *Cystic Carcinoma* has the general characters of a papillomatous cyst-adenoma. It is multilocular or unilocular, usually the former, and has intracystic or surface papillo-

FIG. 123.—Papillomatous Cyst—Adenoma of Ovary.

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mata, and it is often only by microscopic examination that the malignant character is revealed (Fig. 125). The malignancy may be superimposed on a tumour originally benign or it may have accompanied the growth from the beginning. In addition to the malignant papillomata, solid, whitish, putty-like growths of cancer may be found embedded in the substance of the tumour.

The papillomatous type of carcinoma is invariably accompanied by ascites.

FIG. 124.—Solid carcinoma of ovary.

(*b*) *Solid Carcinoma* occurs usually as lobulated growths, which may develop into large abdominal tumours. They are often pedunculated and at first can be moved freely in the abdomen. They are often densely hard, and in shape and consistence often simulate fibromyomata (Fig. 124).

They may be accompanied by ascites, though this is not uncommonly absent.

The growth in time breaks through the covering of the ovary and becomes adherent to adjacent structures.

Macroscopically such tumours on section have a firm surface with paler soft areas. The softening may be so great

as to make these areas brain-like in character. Occasionally regions of cystic degeneration are present (Fig. 124).

Microscopically the tumour consists of solid plugs of epithelial cells surrounded by stroma. In some instances the malignant cells are scattered singly or in small packets throughout the connective tissue stroma. Such cases are often like a sarcoma.

Secondary Carcinoma of Ovary may have its origin in the uterus, the Fallopian tube, the bowel, the liver, or the breasts. As a rule it is bilateral. The ovarian tumours may grow to a large size and may, because of their rapid development, mask the carcinoma of the bowel or other organ from which they are derived.

They may be accompanied by ascites.

Macroscopically they are difficult to distinguish from a primary solid cancer.

Microscopically they possess the characters of their parent growth.

CONNECTIVE TISSUE TUMOURS OF OVARY

Tumours growing from the ovarian stroma may be benign or malignant.

Benign Connective Tissue Tumours.—Fibroma of the ovary occurs in the form of nodules of fibrous growth in the substance, or projecting as warty or small pedunculated tumours on the surface of the ovary. These *circumscribed* fibromata are rarely of clinical importance. *Diffuse* fibromata occur as tumours, which often develop to a large size. They are usually ovoid in shape and are pedunculated. They are subject to axial torsion. Their shape and consistence often make them closely resemble uterine fibromyomata. They are occasionally accompanied by ascites.

Fibromyomata of the ovary are comparatively rare. They may reach a large size. **Adenomyoma** is very rare. Here the connective tissue elements are combined with glandular elements.

Malignant Connective Tissue Tumours.—Sarcomata of the ovary are rare. They occur in two types: (*a*) spindle celled, (*b*) round celled.

FIG. 125.—Cystic Carcinoma of Ovary.

There are two types of teratomatous tumour of the ovary : (*a*) cystic—dermoid cyst, (*b*) solid—solid teratoma.

Dermoid Cyst.—Dermoid cysts of the ovary form about 10 per cent of all ovarian tumours.

They are found at all ages from intrauterine life onwards. They are usually unilateral, but may be bilateral. Typically they are ovoid, unilocular tumours with a pedicle. They are usually about the size of the fist, but they may grow to a size larger than the foetal head.

Sometimes the tumour consists of several loculi. Occasionally a dermoid cyst may form one compartment of a multilocular pseudomucinous cyst. Being pedunculated it is liable to axial torsion.

It has a dough-like feel when handled, though at body temperature the contents are liquid. When examined at the end of an operation it is found that the lowered temperature has caused a coagulation of the fatty contents.

When opened the cyst is seen to contain a brownish yellow grease-like matter, scattered about which, in the majority of cases, numbers of loose hairs are present. Sometimes the hair is so plentiful that it is gathered into locks. In some instances pellets made of the greasy content are found loose in the cavity.

On turning out the contents, a mass is found adherent to one part of the lining wall and projecting into the cavity. This is the *dermoid eminence* from which the hairs spring (Fig. 126). One or more teeth growing from a piece of bone are often found set on the eminence, and projecting into the cyst cavity.

In rare cases a dermoid cyst may become malignant, the usual condition being a squamous epithelioma. Occasionally malignant growths reproducing the structure of thyroid develop in the ovary.

Microscopically the dermoid eminence consists of skin and hair follicles and sebaceous skin glands, from which the fatty matter is secreted. In addition to these epidermal structures and the teeth, other structures derived from the outer embryonic layer may be present—*i.e.* mammary tissue, and neuroglia. Not infrequently also mesodermic elements—bone, muscle, etc., are found, as also entodermic structures—mucosa of intestine, thyroid gland, etc.

The lining of the remainder of the cyst may be composed of an epithelial layer. In other cases it is merely a sort of granulation tissue.

Solid Teratoma.—This is a very rare ovarian tumour. It occurs mostly in young women, and consists of a mingled

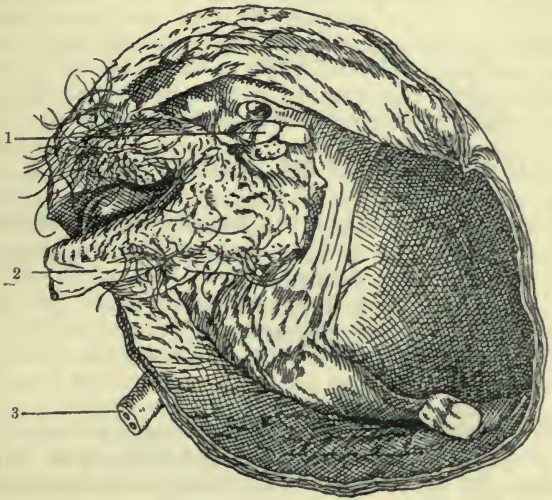

FIG. 126.—Dermoid cyst of ovary.

1. Teeth. 2. Hair. 3. Pedicle.

confusion of embryonic elements, epidermic, mesodermic, and entodermic. The tumours are lobulated and may grow to a large size. On section they are characteristically soft and brain-like, with scattered cystic spaces. Solid teratomata are malignant and often grow very rapidly. The embryonic elements that proliferate to malignancy, if connective tissue in origin, produce a sarcoma, if epithelial in origin, a carcinoma.

CHAPTER XXXI

NEW GROWTHS OF THE OVARY (*continued*)

COMPLICATIONS OF OVARIAN TUMOURS

THE complications to which ovarian tumours are subject are :

1. Axial torsion.
2. Infection.
3. Rupture.
4. Malignancy.

AXIAL TORSION

This consists of a twisting of the pedicle of a tumour on its long axis. The pseudomucinous cyst-adenomata, dermoid cysts, and the solid fibromata are the tumours most prone to torsion as they are usually pedunculated.

The cause of the condition is obscure, but it seems to be associated with the eccentric play of forces to which a tumour is exposed in the abdomen. The meaning of this will be partly clear when it is remembered that the amplitude of respiratory movement of the structures lying against the anterior abdominal wall—*e.g.* omentum—is greater than that of the structures lying against the posterior wall. The front of a cyst tends to be rolled down during the downward movement of the omentum and pulled up again during the upward movement. An excessive rotation in one of these directions may be so great that the tumour is unable to recover its position, and twisting begins. Torsion of a pedicle is said to occur more commonly in the direction which implies rotation of the front of the tumour outwards—*i.e.* in the direction in which the hand on the same side will move during supination.

Torsion is rare in small tumours which lie in the pelvis. The eccentric play only comes into existence, as a rule, when the tumour rises into the abdomen. Pregnancy, by lifting a tumour from the pelvis into the abdomen, increases the chance of torsion, with the result that torsion is relatively frequent in ovarian tumours complicating pregnancy. It is also of frequent occurrence in the puerperium.

The importance of axial torsion consists in the obstruction of the blood-vessels in the pedicle, which it produces, with a consequent involvement of the nourishment of the tumour.

The torsion may be gradual or acute. In **gradual torsion** the process may continue for a considerable time without any untoward effects on the tumour. The vessels, by stretching slightly, accommodate themselves to the new circumstances. In this way a pedicle may have six or more twists on it with no appreciable effect on the tumour. In other cases, with much less torsion the circulatory changes appear.

The first effect will be on the thinner-walled veins, whose walls will be pinched more readily than the thicker arteries. Increasing *congestion* will be the first change, with oedema and swelling of the tumour, and some haemorrhage into the cyst walls and cavity. An irritative process is started on the surface of the tumour, with the laying down of *adhesions* that bind it to neighbouring organs. If time is allowed, these become denser and vascularised, and when the pedicle is completely atrophied by torsion, the tumour may be dependent entirely on its adventitious blood-vessels. This is the so-called *parasitic tumour*.

Infection, as the result of migration of organisms from the bowel, may lead to a sudden swelling of the tumour with suppuration.

Acute torsion occurs suddenly, often as the result of a straining effort, and is associated with rapid changes in the tumour. *Congestion* and *haemorrhage* are the immediate effects. The tumour swells and becomes purple or black from the effusion of blood. The tube, if strangled in the pedicle, shows similar changes. If removal is not immediately carried out *gangrene* and *infection* will occur.

Infection

Pyogenic infection of an ovarian tumour is apt to follow any condition, which leads to damage of the tumour—*e.g.* trauma, axial torsion. Axial torsion is the commonest cause. Occasionally a tumour is infected from an inflammatory condition in the bowel—*e.g.* appendicitis and tuberculosis, and a cancer of the bowel may become adherent to, and infect a neoplasm of the ovary.

The affected tumour swells by oedema and becomes *adherent* over its surface to the surrounding organs. In many cases such a tumour becomes firmly bound to uterus, tube, rectum, omentum, etc., and its surgical removal is difficult or impossible.

Suppuration and pus formation may occur, and, in the case of a cyst, the cavities may become filled with purulent material. The pus may rupture into the bowel, vagina, bladder, or on to the abdominal wall. In other cases a spreading and fatal peritonitis may develop.

Rupture

This is not uncommon in cystic tumours, especially the pseudomucinous variety. The usual **cause** is *trauma*, such as a blow on the abdomen or a sudden straining effort. Ovarian cysts, which lie in the pelvis, are occasionally ruptured during labour, as the result of the expulsive efforts of the uterus, or during forceps delivery. A small follicular cyst may be felt to collapse during a bimanual examination, an incident generally of no great clinical moment.

Spontaneous rupture occurs sometimes, due to the gradual thinning out of the cyst wall, until it can no longer withstand the intracystic pressure.

The **effects** of rupture vary in different cases. An innocent follicular cyst will shrivel, and its escaped contents will do no peritoneal harm. The same fortunate result may attend a rupture of a pseudomucinous cystoma. Here, however, there is a grave risk of the engrafting of multiple portions of the cellular material on to the peritoneal surfaces of the abdomen. The cells so engrafted grow and reproduce the characters of the parent tumour, with the formation of pseudomucinous

cysts diffusely scattered over the peritoneum and accompanied by intractable ascites. This condition is clinically malignant. It is named *pseudomyxoma peritonei.*

As was indicated in a preceding paragraph, an abscess formed in an ovarian cyst may rupture into any of the hollow situations or on to the anterior surface of the abdomen.

Malignancy

This complication has been considered under the heading of malignant tumours of the ovary.

CHAPTER XXXII

NEW GROWTHS OF THE OVARY (*continued*)

CLINICAL FEATURES OF OVARIAN TUMOURS

THE different classes of ovarian tumours have so many features in common that clinical differentiation between them is often difficult. It is often impossible for the surgeon to satisfy himself of the type of tumour present except by operation.

SYMPTOMS

Small simple tumours lying in the pelvis may be symptomless. The general surgeon often finds a follicular, pseudomucinous, or dermoid cyst by accident in the pelvis of a patient operated upon for some other condition. Similarly such neoplasms are common in the post-mortem room. Even a fairly large, slow-growing tumour rising into the abdomen may not attract the patient's special attention, and may be discovered only by the gynecologist when the patient presents herself because of pain or some other recent symptom.

Small tumours in the pelvis may cause frequency of micturition from pressure, but this is rare, as are other symptoms of pressure, such as pain and constipation.

Swelling of the abdomen is often the first symptom. In cystic ovarian tumours it may be fairly rapid, especially in tumours accompanied by ascites—*e.g.* the papillomatous cysts and the malignant growths. The swelling in the course of time causes discomfort. By pressing on the abdominal organs it induces dyspepsia, and, if large enough, may embarrass the respiration. The classical tumour of colossal dimensions is now a clinical rarity (Figs. 127, 128).

Pain is *relatively a common symptom* in ovarian tumours. It is referred to the lower and lateral part of the abdominal wall corresponding to the side from which the tumour is growing. It occasionally happens that a tumour with a long pedicle wanders across the abdomen to the opposite side.

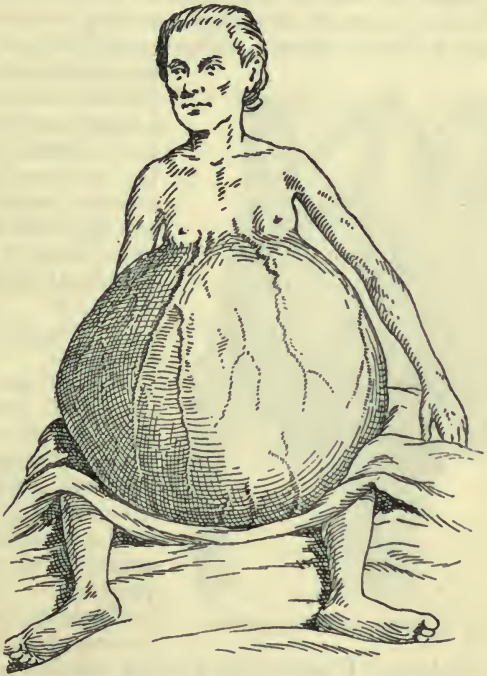

FIG. 127.—Large ovarian cyst.

The pain in such cases is an almost infallible guide to the side of the pelvis from which it originates. The pain may be due to pressure on the ovarian nerves. In many cases it is due to torsion, and recurring pains often foreshadow the development of an acute torsion.

Pain, also, is a marked feature in infected tumours, and in some cases after rupture.

Menstrual symptoms are uncommon in ovarian tumours. Twisted and malignant tumours may be accompanied by menorrhagia or metrorrhagia. Amenorrhoea is rare and is due to complete destruction of ovarian tissue by bilateral growths. Dysmenorrhoea is relatively uncommon. It is believed by some gynecologists to be a feature in follicular distension cysts. If such cysts are associated, as they often are, with chronically inflamed adnexa, premenstrual dysmenorrhoea may be present, but the pain is then due to the general congestion of the appendages and the surrounding peritoneum, both of which are aggravated by the hyperaemia of the premenstrual phase.

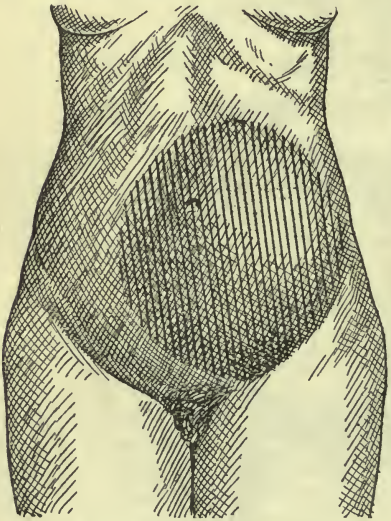

FIG. 128.—Outline of ovarian tumour.

SIGNS

Small tumours lie in the pelvis usually behind the uterus in the pouch of Douglas, where they are recognised as insensitive, rounded, solid, or cystic swellings freely mobile on their pedicle.

They are usually unilateral, but in some case are bilateral. If sessile and growing within the layers of the broad ligament, they are less mobile and may actually seem fixed to the uterus. Rarely a small tumour lies in the utero-vesical pouch in front of the uterus.

Larger tumours rise into the abdomen where they ride free, if they are pedunculated, and in such cases the range of mobility may be great.

In the abdomen the tumour is either mesial or eccentric. Sessile tumours remain partly in the pelvis as a rule, as may also a pedunculated tumour at its lower pole. Abdominal

ovarian tumours have typically a rounded, defined, and firm contour, and are insensitive on pressure. Lobulated, cystic, or solid tumours are bossed and irregular on the surface. Cystic tumours, unless too tightly distended, give a thrill transmitted from one hand to the other across the abdomen, when one side of the tumour is flicked suddenly with the finger. Failure to elicit this sign at first may mean that the wave has been intercepted by a septum between two loculi. In such cases the phenomenon is obtained when the hands are brought closer. A tense cyst may feel like a solid tumour.

Papillomatous cystomata and malignant tumours form bilateral swellings in the lower abdomen, which are often dense and fixed. The other classes of ovarian neoplasm may be bilateral, though not so commonly.

On percussion a dull note is present over the tumour, and this is surrounded, above and to the sides, by a tympanitic note. Occasionally bowel crosses the lower pole of the tumour.

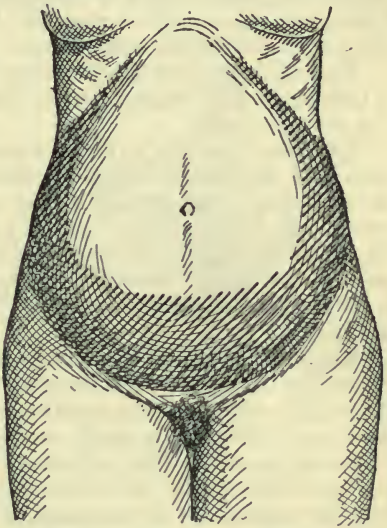

FIG. 129.—Area of dulness in ascites.

With ascites the flanks are full and are dull on percussion.

Tenderness on pressure over the abdominal wall implies some peritoneal involvement, and is usually due to torsion, infection, rupture, or malignancy.

CLINICAL FEATURES IN TORSION, INFECTION, RUPTURE, AND MALIGNANCY

Axial Torsion.—If *gradual* there may be no symptoms at first or there may be recurring attacks of abdominal pain, with

perhaps sickness and vomiting. A rapid increase in the size of the tumour, accompanied by tenderness, is usually also present.

If *acute* the symptoms and signs develop rapidly. Acute abdominal pain and tenderness are present, at first diffuse, then localising themselves to the lower and lateral abdomen. This is accompanied by sickness and vomiting, furring of the tongue, rapidity of the pulse, and collapse. Acute axial torsion may thus simulate any of the conditions causing an acute abdominal crisis, such as ruptured tubal pregnancy, appendicitis, ruptured gastric ulcer, hepatic or biliary colic, etc.

Haemorrhage from the uterus not infrequently accompanies a twisted ovarian tumour, and is due to congestive flushing of the uterine vessels.

Infection of an ovarian tumour is accompanied by abdominal pain and tenderness over the tumour, with temperature and rising pulse. It is usually a later stage of axial torsion. If unrelieved by operation, a fatal peritonitis may supervene. In other cases, after an interval of time, an abscess may form and rupture into a viscus or through the abdominal wall. Such a result may be followed by an immediate alleviation of symptoms.

Rupture of a cyst may be accompanied at the moment by a sense of relief. In other cases sudden pain is felt, passing off and giving place to the same sense of well-being. Within a few days, however, an ascitic accumulation gathers and again awakens anxiety. This indicates irritation of the peritoneal surfaces, induced by the tumour contents. This ascites may be very rapid in its development.

Malignancy as a rule is indicated by rapidity of growth, ascites, and failing health and weight, especially if the tumour is in an elderly woman. Some of these clinical features, however, are common in benign tumours. Ascites, for example, is often present in fibromata. It is present usually in serous papillomatous cysts. It is said that blood-stained fluid is more commonly present in malignant ascites. Some malignant tumours develop in young women or children, *e.g.* sarcoma.

In many instances, malignancy is only established at operation or after microscopic examination of the tumour removed.

Differential Diagnosis of Ovarian Tumours

An ovarian tumour lying entirely **in the pelvis** may be mistaken for other types of pelvic swelling. Confusion is especially likely to arise in the case of the pregnant uterus, fibromyomata of the uterus, and a mass due to tubo-ovarian inflammation.

Pregnancy in the early months is usually easily distinguished by the history of amenorrhoea and morning sickness, softening of the cervix and the definite uterine swelling, rounded and contracting. Occasionally, however, especially in the absence of a definite history, the uterine body expanded by a gestation and moving freely about may seem to be separate from the cervix and suggest a neoplasm. The supravaginal cervix is sometimes so soft that it is not felt on bimanual examination, and this exaggerates the sense of separateness of the uterine swelling and the similarity to an ovarian tumour. This is the so-called *Hegar sign* in pregnancy, which is found characteristically about the end of the eighth week (Fig. 130).

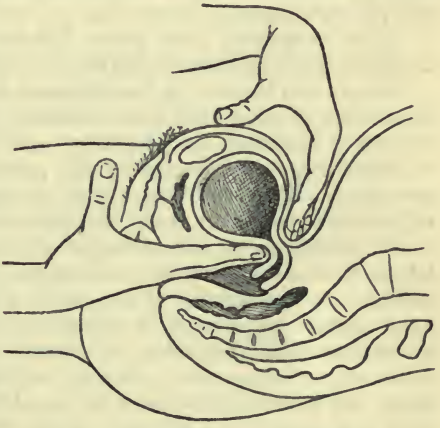

Fig. 130.—Hegar sign in pregnancy.

A pedunculated *fibroid* may resemble an ovarian tumour, but in such cases the history of haemorrhage due to associated submucous growths, the presence of other growths causing a nodular enlargement of the uterus, and in most cases the definite attachment of the fibroid pedicle to the uterus, eliminate any confusion.

A tubo-ovarian inflammatory mass is, typically, markedly adherent behind the uterus. It is usually bilateral and is tender on pressure. In addition, there is often a history of

preceding gonorrhoeal or puerperal infection and recurring attacks of pain in the lower abdomen, often menstrual in time. Such cases are easily distinguished from an ovarian tumour. A hydrosalpinx may be mobile and may be mistaken for an ovarian tumour. Here there is often a history of preceding infection, and examination often reveals an inflamed and swollen tube on the other side. In cases of *tuberculosis*, a cystic accumulation in the centre of the tubercular adhesions may closely resemble an ovarian cyst and can only be eliminated by a careful investigation of the history and physical signs.

Tubal pregnancy may cause difficulty but is usually distinguished by the history and signs.

An ovarian tumour **in the abdomen** has to be distinguished from other types of abdominal tumour. Here, again, the chief sources of confusion are pregnancy and fibromyomata.

Pregnancy is recognised by the presence of the symptoms and signs. In some cases, *e.g.* in an unmarried woman who refuses to divulge her state, the signs alone are usually sufficient, ballottement, the noting of the foetal parts and foetal heart, intermitting uterine contraction, and softening of the cervix. In *retroversion of the gravid uterus*, where the pregnant uterus incarcerated in the pelvis often leads to retention of urine and the formation of a cystic bladder tumour in the abdomen, the diagnosis is usually easy from the history and signs, and is clinched by the collapse of the abdominal tumour after the passage of a catheter (see p. 99).

Fibromyomata are recognised by the history of uterine haemorrhage in many cases, and by the slowness of their growth as compared with ovarian neoplasms. Pain and tenderness are common in ovarian, and rare in fibroid tumours. The physical signs usually complete the distinction. The usual ovarian tumour is cystic, whereas, except in rare cases, a fibroid is densely hard. A pedunculated fibroid moving freely may, however, often closely simulate a pedunculated ovarian tumour. So, hard, fibromatous, or malignant ovarian tumours may closely simulate fibromyomata.

Ascites, kidney and splenic and mesenteric tumours, as also inflammatory masses associated with tuberculosis, can usually be distinguished by the history and by the physical examination.

CHAPTER XXXIII

NEW GROWTHS OF THE OVARY (*continued*)

TREATMENT OF OVARIAN TUMOURS

THE common small follicular cyst of the non-adherent ovary found accidentally in the course of an abdominal operation does not require removal. If symptoms have necessitated the opening of the abdomen specially in such cases, the cystic part of the ovary may be excised by what is called **resection of the ovary,** and the wound in the organ closed up by a fine suture. The same treatment will apply to most cases of haematoma of the ovary. This conservative method should be employed in the case of bilateral involvement of the ovary. If one ovary is markedly cystic and the other is healthy, the diseased organ should be removed entire.

In the case of the ordinary tumours **removal of the ovary (ovariotomy)** should be carried out. In the case of the simple tumours the affected ovary should be removed. In the case of papillomatous cystomata, and in all malignant tumours, both ovaries are removed along with the uterus, by hystero-salpingo-oöphorectomy. The hysterectomy is carried out through the isthmus.

Ovarian cysts should be removed entire, even though this entails a large abdominal wound; for the old method of tapping the cyst by a trochar and cannula (Fig. 131), in order to reduce its size, is associated with the risk of leakage of the contents into the abdominal cavity. This accident may result in the production of the serious condition of pseudomyxoma peritonei.

Tumours complicated by axial torsion, rupture, and infection should be removed at the earliest possible moment. Suppurat-

ing and adherent tumours may be best treated by evacuating their contents through a small abdominal wound and allowing the cyst cavity to close from the base by a process of collapse and granulation. In such cases complete extirpation may be impossible or dangerous.

Ascites associated with an inoperable papilloma or cancer is treated by periodical abdominal tapping with a trochar and cannula. So with ascites due to irremovable peritoneal growths.

OVARIAN TUMOURS AND PREGNANCY

Ovarian tumours predispose to sterility, but in their presence a woman may become pregnant. The subsequent course of the pregnancy varies in different cases.

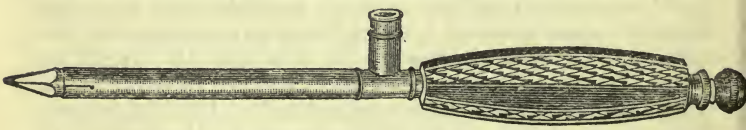

FIG. 131.—Trochar and cannula.

Symptoms and Signs.—A pregnant woman with an ovarian tumour has an abdominal swelling in size out of proportion to the number of months of amenorrhoea. This will require to be distinguished from other conditions causing a similar undue abdominal enlargement, hydramnios, multiple pregnancy, fibromyomata plus pregnancy, hydatidiform degeneration of the chorion, and retroversion with distension of the bladder.

Results.— *Abortion* may occur in the case of a growth fixed in the pelvis and preventing normal expansion of the uterus. So, later, premature labour may occur.

During pregnancy the tumour is particularly prone to *axial torsion*. The other complications, rupture and infection, may likewise, though more rarely, occur.

The *course of labour* will depend almost entirely upon whether the growth is in the abdomen or is in the pelvis below the child. In the former case the labour may be uncomplicated, in the latter, obstruction of labour will occur if the tumour is of appreciable size (Fig. 132). Strong uterine efforts may rupture a cyst, in which case the obstruction to labour is

relieved. In rare cases the tumour is driven down through some part of the pelvic floor, *e.g.* the rectum, and delivered in front of the head.

In still other cases inertia uteri or uterine rupture occurs.

In the puerperium, a tumour may become twisted or, if damaged by labour, it may give rise to trouble from infection.

Treatment.—This consists in removal of the tumour when its presence is recognised *during pregnancy*. If there are no indications urging immediate removal, however, the extirpation should not be carried out until after the first three months, as the risks of post-operative abortion are diminished after this term.

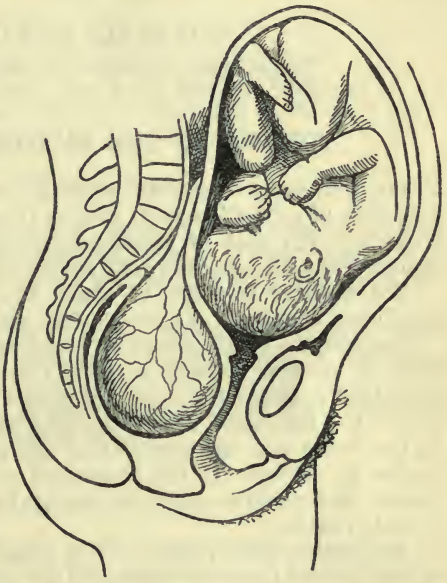

Fig. 132.—Ovarian tumour obstructing labour.

During labour the tumour, if below the head, should be pushed up into the abdomen and, if there is any risk of its descending again, the labour should be ended as speedily as possible with forceps. If the tumour is firmly impacted under the head it may, if cystic, be tapped through the vaginal fornix by a trochar and cannula. Removal of the cyst is then carried out through the posterior fornix, or through a laparotomy wound, at the end of labour.

In other cases Caesarean section followed by the removal of the tumour is required.

In the puerperium, a twisted or infected tumour should be immediately removed through an abdominal incision.

CHAPTER XXXIV

TUMOURS OF THE TUBE AND BROAD LIGAMENT

TUMOURS OF THE FALLOPIAN TUBE

PRIMARY tumours of the Fallopian tube are rare. A **secondary** extension of a papillomatous growth is common from ovaries, which are the seat of papillomatous cyst-adenoma. So, a cancer of the uterine body may spread to the tube.

The **primary** tumours to which the tube is subject are papilloma, adenoma, adenocarcinoma and chorionepithelioma.

Papilloma.—This consists of a soft warty growth derived from the mucous membrane of the tube. It tends to form a mass that distends the tube and causes a thinning out of its wall. The fimbriated end of the tube may be closed or open. In the latter case the secretion of the cells of the papilloma causes an ascites. If the abdominal end is closed and the uterine end remains open, there may be a watery discharge from the uterus.

Adenoma.—This consists of a tumour formed of gland spaces derived from the mucosa of the tube.

Adenocarcinoma.—This is usually bilateral. It affects women about the menopause. In the beginning the tubes become distended from within by the soft yellowish white growth. The growth eats through to the peritoneum, when a rapid dissemination in the pelvis and abdomen is apt to occur. Under the microscope the tumour consists of gland spaces, which infiltrate the muscular wall of the tube, and whose cells exhibit the uncontrolled proliferation of malignancy.

The *symptoms and signs* consist of pain in the lower abdomen, ascites, and the presence of a palpable growth or growths in the pelvis behind the uterus in the site of the tubes.

Chorionepithelioma of the tube is rare. It usually implies a *secondary* spread from an affected uterus, though it may occur as a *primary* growth subsequent to tubal pregnancy.

The **treatment** of tumours of the tube is removal. In the case of a malignant tumour and a papilloma, which has spread beyond the confines of the tube, total hysterectomy, accompanied by bilateral removal of the appendages, is performed.

TUMOURS OF BROAD LIGAMENT

The broad ligament may be the seat of solid or cystic tumours.

Solid Tumours

Fibromyoma.—This may grow directly from the fibromuscular tissue of the broad ligament, or it may arise from the side of the uterus or cervix and burrow into the broad ligament.

Adenomyoma.—This also may arise either primarily in the broad ligament or spread into it secondarily from the side of the uterus.

Sarcoma is rare. When present it is usually a secondary change in a broad ligament fibroid.

Cystic Tumours

Cystic tumours of the broad ligament may arise from the epithelial elements of the parovarium or paroöphoron. Recently a new origin for broad ligament cysts has been described in the shape of fragments of ovarian tissue, which during development arise and persist in the vicinity of the tubal fimbriae. Finally it should be remembered that some broad ligament cysts arise in the ovary, from which in their growth they burrow between the leaves of the ligament. Other types of cysts, which are ordinarily of no clinical moment, are derived from the Kobelt's tubules, whilst small cystic swellings filled by a serous fluid sometimes lift up the peritoneum in the form of clear bullae.

Parovarian and paroöphoronic Cysts.—The position and

structure of the vestigial elements from which these cysts arise have been described on p. 29. The tumours are usually small, unilocular cysts filled with a watery fluid, and lined by a cuboidal epithelium. As they grow they displace the tube across their surface and, in the process, the tube may become stretched and lengthened.

Fimbrial Cysts.—These, unlike the former class, originate in the outer part of the broad ligament. They are usually unilocular, their contents are watery, and they are lined with a

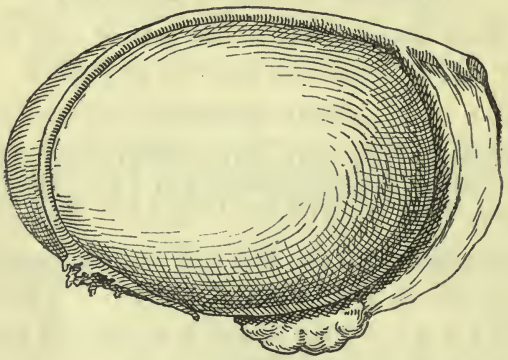

FIG. 133.—Broad ligament cyst.

cubical epithelium. If they reach any size they stretch the tube over their surface (Fig. 133).

Cysts of Kobelt's Tubules.—These occur as a cluster of small cysts formed by a division of the outer end of the Gärtner's duct. The cysts hang free of the broad ligament by fine pedicles. Occasionally the torsion of the narrow neck of one such cyst may cause an acute strangulation accompanied by abdominal pain.

Serous bullae are common in the broad ligament and on the surface of the tube. They are often multiple and vary from the size of a pin-head to a pea or larger. They are apparently due to blocked lymphatics.

Symptoms and Signs of Broad Ligament Tumours

When small, broad ligament tumours lie in the pelvis and give rise to no symptoms as a rule. Even when small, however, they may become pedunculated and **torsion of the pedicle** of the tumour then gives rise to symptoms and signs indistinguishable from those caused by the twisting of the pedicle of an ovarian tumour (*q.v.*).

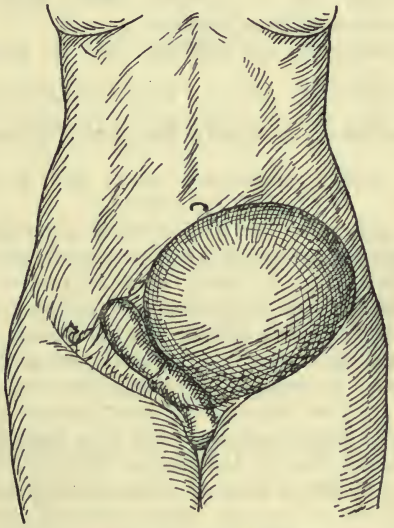

Fig. 134.—Broad ligament tumour, lifting the uterus and broad ligaments into the abdomen.

Ordinarily a broad ligament tumour is sessile. It spreads apart the leaves of the broad ligament and **rises into the abdomen,** lifting the uterus and the tubes and ovaries up with it. In such cases the solid or cystic swelling is felt above the pubis usually occupying an eccentric position. The uterine body and the appendages may be felt riding on its side or perched on its summit. On vaginal examination a characteristic sign in these cases is the **lifting up of the cervix,** so that it may be difficult to reach (Fig. 134).

If a broad ligament tumour reaches any considerable size it is apt to strip the peritoneum off the rectum and pelvic colon, and, rising into the abdomen, it may open out the layers of the mesentery of the sigmoid or caecum or even of the small intestine. The tumour then becomes *retroperitoneal*, when its removal becomes a matter often of great surgical difficulty.

In causing an upward displacement of the uterus a broad ligament tumour resembles a cervical fibroid. It will be remembered also that a cervical fibroid often establishes similar retroperitoneal relationships.

Malignant tumours, *e.g.* sarcoma, may be associated with **ascites.**

Treatment of Broad Ligament Tumours

The only possible treatment, where such is necessary, is **removal.**

After the abdomen has been opened an incision is made through the peritoneal covering of the tumour, which may now be shelled out easily. In other cases the removal is difficult because of adhesions, or because of its deep burrowing into the lower levels of the pelvis or into retroperitoneal regions. In the former case the ureter may be stretched across its lateral surface and may be injured or actually severed unless great care is taken. In the latter case the extirpation of the tumour may be possible only if accompanied by a **resection of bowel.** Where the uterine wall is denuded of its peritoneum by the growth it may be better in some cases to carry out a subtotal hysterectomy.

Pedunculated broad ligament tumours which are twisted are treated by immediate removal.

SECTION VIII

DEVELOPMENT AND ERRORS OF DEVELOPMENT—ATRESIA

CHAPTER XXXV

DEFECTS OF DEVELOPMENT—ATRESIA

An understanding of the developmental defects to which the female organs are subject presupposes a knowledge of the normal development of these organs. In this book only a general outline of this subject is possible.

DEVELOPMENT OF FEMALE PELVIC ORGANS

The Fallopian tubes, uterus, and vagina are all developed from the two Müllerian ducts, whilst the ovaries are derived from the primitive genital glands. There are in the female pelvis of the adult certain structures derived from the Wolffian bodies and ducts, and a short account of these is necessary.

Müllerian Ducts.—These are two tubes one on each side, which run downwards along the postero-lateral walls of the abdomen and pelvis in the early embryo. From the beginning the cephalic end of each tube opens into the coelome in a funnel-shaped aperture ; this is later the fimbriated end of the tube. In rare cases there may be several fimbriated ends. The upper parts of the Müllerian ducts are separate throughout their whole development and they form the Fallopian tubes. In their lower parts the Müllerian ducts descend side by side,

separated by their intervening walls. The disappearance of these walls after a time leads to a fusion of the ducts in this part to form a single canal. The lower end of the Müllerian duct grows downwards towards the urogenital sinus as a solid plug which becomes canalised. This canal is separated from the urogenital sinus at first by a septum. With the disappearance of this septum the single Müllerian duct opens into the sinus ; this occurs about the fifth month.

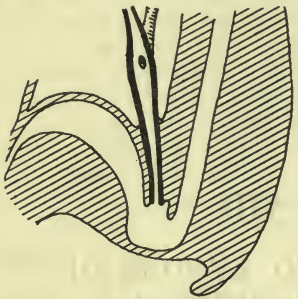

FIG. 135. — Development of the pelvic organs. The dark lines indicate the Müllerian ducts. In front is bladder and urethra ; behind is bowel.

In the course of time the part of the combined canal that is to form uterus becomes the seat of a specialised development of muscle and mucous membrane, and the projection into the canal of a conical part of the uterus (vaginal cervix) confirms the distinction between uterus and vagina (Figs. 135-137).

In the foetus the cervix is the larger part of the uterus and this is the condition present in the new-born infant. Between birth and puberty the body grows at a relatively greater rate than the cervix.

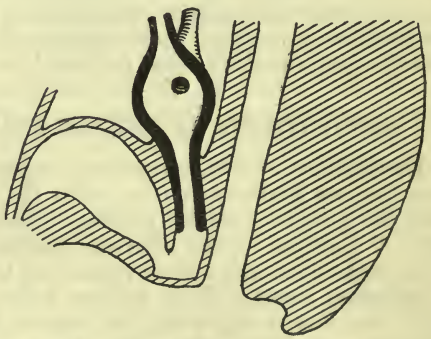

FIG. 136.—Development of the pelvic organs.

Ovaries.—These arise from two long streaks of epithelium that develop on each side just internal to the Wolffian bodies. The middle portions of these streaks show a specialised development of epithelium and project into the coelomic cavity as two elongated eminences, one on each side,—the *genital glands*.

The genital glands consist at first of several layers of epithelium—*germinal epithelium*—amongst which, from an early stage, larger cells are visible—*the ova*. As growth continues strands of connective tissue extend from the adjacent Wolffian bodies into the genital glands. The epithelial elements of these grow in their turn into the connective tissue and there is thus produced the characteristic appearance of plugs or cords of epithelium containing scattered ova surrounded by a connective tissue stroma. To begin with, the plugs are continuous

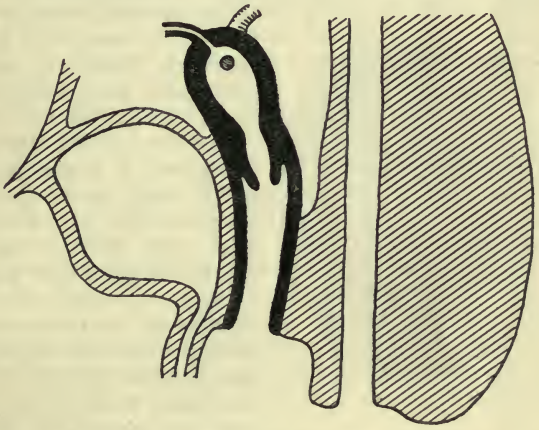

FIG. 137.—Development of the pelvic organs.

with the surface epithelium. In the course of time, however, the incursions of connective tissue break the plugs of epithelium into isolated masses, each of which forms the basis of a Graafian follicle (Fig. 138). The outward growth of connective tissue eventually cuts the follicles off from their parent epithelium, which remains merely as a single layer of epithelium covering the mature gland. Sometimes, however, a trace of the original mode of development is seen in the existence of tubules dipping down into the stroma from the germ epithelium. At the end of development the follicles and ova are confined to the cortex of the ovary.

It is believed by some that the deeper extensions of the

epithelial plugs may become channelled to form the rete ovarii, which consists of a system of tubules in the hilum of the ovary, and by means of which the ducts of the Wolffian tubules are united up with the epithelium elements of the genital glands. In the testis such an arrangement is necessary for the conveyance away of the spermatozoa.

Wolffian Bodies and Ducts.—The Wolffian bodies lie on each side internally to the Müllerian ducts and extend downwards to open on the urogenital sinus as the Wolffian ducts.

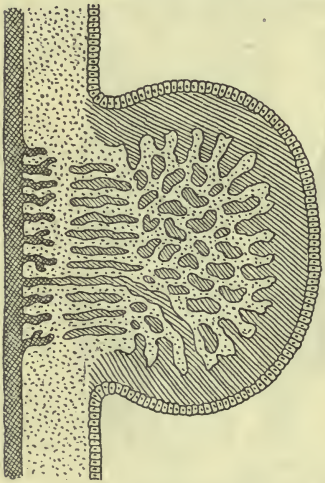

FIG. 138.—Diagram showing development of ovary.

The Wolffian system in the female is vestigial. As the Müllerian system develops it undergoes retrogression. In the adult female it is represented by (1) *the hydatid of Morgagni*, a series of cysts which dangle from the broad ligament near the tubal fimbriae. (2) *The parovarium*; this lies in the broad ligament between tube and ovary, and consists of a transverse duct uniting a series of longitudinal tubules that converge towards the hilum of the ovary. This part corresponds to the epididymis in the male. (3) *The paroöphoron*; this consists of a series of isolated tubules lying in the broad ligament internally to the parovarium. (4) *Duct of Gärtner*; this is the continuation of the transverse tube of the parovarium. In the human it passes inwards to the uterus, where it usually disappears. In some instances, however, it persists as isolated fragments of a tube situated on the antero-lateral wall of the vagina, where it may be the origin of cystic tumours. The duct of Gärtner corresponds to the vas deferens in the male.

Urogenital Sinus.—This is formed from the ventral aspect of the cloaca. The cloaca is a blind pouch formed by the hinder end of the gut. It lies up against the ventral wall of

the embryo from the level of the umbilicus backwards to the tail. The ventral covering is called the cloacal membrane. Projecting forwards from the mesial and upper part of the pouch is the allantois (Fig. 135).

The Wolffian duct opens into the front part of the cloacal cavity on each side.

At an early stage a transverse septum grows downwards and divides the cloaca into a posterior, rectal portion and an anterior, genito-urinary portion. This septum eventually reaches the cloacal membrane, when the separation of the two compartments becomes complete (Figs. 136-137).

The Müllerian ducts at a later date than the Wolffian ducts burrow downwards and open by a single orifice into the genito-urinary compartment between the Wolffian openings. The part of the canal below the Müllerian prominence, *i.e.* the point where the Müller's duct opens, is called the urogenital sinus. The upper part of the anterior compartment later becomes the bladder and urethra. By a giving way of the cloacal membrane the sinus opens externally (Fig. 137).

The urogenital sinus is at first a long thin canal, but as development proceeds it becomes opened out and shortened until the Müllerian prominence in the end lies in a fossa near the surface, *i.e.* the cleft of the vulva. From the Müllerian prominence the hymen is developed.

The posterior compartment of the cloaca opens through the cloacal membrane (the anus) at a later stage than the urogenital sinus.

External Genital Organs.—The vestibule and fossa navicularis are the derivatives of the flattened out urogenital sinus (Fig. 137). The clitoris and labia majora are derived from a tubercle, which appears in front of the sinus urogenitalis. The labia minora are formed from the margins of the opening of the sinus.

DEVELOPMENTAL DEFECTS OF THE FEMALE ORGANS

Absence of the genitalia in whole or in part is rare. *Absence of the uterus* probably never occurs, though in cases of complete absence of the vagina it may be represented by a mere nodule of fibrous tissue.

Absence of the vagina occurs sometimes. Here the bladder and rectum are separated by a septum of fibrous tissue. *Absence of the vulva* is very rare.

Defects due to Complete or Partial Failure of Union of the Müllerian Ducts

The various conditions possible under this heading are shown in Figs. 139 to 145.

Uterus didelphys.—The uterine segments of the Müllerian ducts remain freely separate and the vaginal segments are

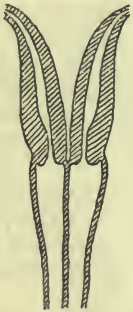

Fig. 139.—Uterus didelphys.

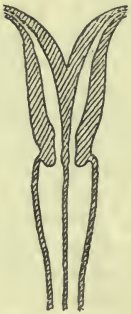

Fig. 140.—Uterus bicornis bicollis.

Fig. 141.—Uterus bicornis unicollis.

separated by a septum. The vaginal orifices on one or both sides may be obstructed by a membrane (Fig. 139).

Uterus bicornis.—Here the uterus is cleft into two horns. In some cases the cervix is divided by a septum (bicollis), which may be present also in the vagina. In other cases there is a single cervix (unicollis). See Figs. 140, 141.

Uterus septus.—Here the external configuration of the uterus is normal, but a septum divides it into two halves and may split the vagina also. In *uterus subseptus* the septum only involves the body of the uterus (Figs. 142-143).

The clinical features associated with the above conditions vary in different cases. There may be nothing to indicate the abnormality unless, in addition to the imperfect fusion of the canals, there is an atresia on one or both sides, when the

menstrual flow may be retained. The presence of a septum may cause *dyspareunia*. Pregnancy may take place in the two halves of a double uterus coincidently or alternately (Fig. 144). Persistent menstruation during pregnancy is sometimes said to be derived from the non-pregnant half of a double uterus.

Fig. 142.—Uterus septus.

Fig. 143.—Uterus subseptus.

Uterus unicornis (Fig. 145).—Here one Müllerian duct only has apparently gone to the development of uterus and vagina. There may be a shrivelled tube on the opposite site, which may or may not communicate with the uterus. Where it communicates it may become the

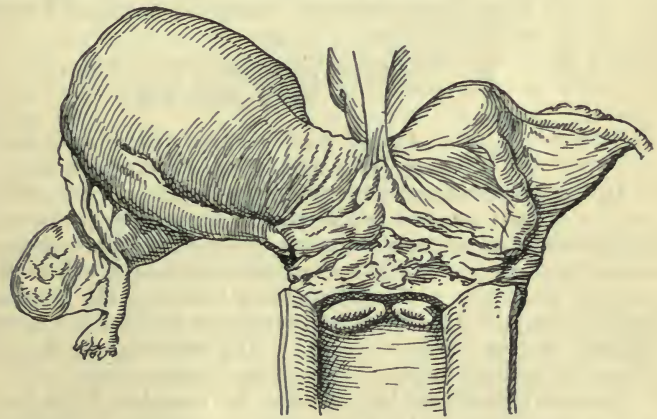

Fig. 144.—Pregnancy in one side of a double uterus.

seat of a pregnancy which, in clinical features and in pathology, as well as in the risks it carries with it, is indistinguishable from tubal pregnancy (*q.v.*).

Developmental defects of the ovary are rare. *Accessory* ovaries may be present. These consist of small portions of ovarian tissue situated in the pelvis, attached to or near the ovary, or placed in a site which corresponds to the track that the ovary normally follows in its descent from the abdomen to the pelvis.

Congenital displacement of the ovary may occur, the commonest being where the ovary is situated within the sac of an inguinal hernia.

Developmental Defects of the Tube.— *Absence* of the tubes is rare, as is also a *rudimentary development* of the tubes. *Accessory fimbriated ostia* are not uncommon. They consist of a superfluous bunch of fimbriae attached to the outer end of the tube. The adventitious ostium may or may not open into the tube lumen.

Congenital displacement of the tube usually accompanies the ovary displaced into the sac of a congenital inguinal hernia.

Fig. 145.—Uterus unicornis.

Hermaphroditism and Pseudohermaphroditism

In the human species individuals with both ovary and testis are extremely rare.

In pseudohermaphrodites the organs present are either ovaries or testicles, and in this respect there is only one sex, but the external genitals correspond to the conditions present in the opposite sex. The commonest condition is where the penis is small like a clitoris, the two halves of the scrotum remain separate like the labia majora, and there is a canal opening externally like a vagina. The testicles may be undescended or they may be in the genital folds.

In such individuals the sex may be mistaken from birth and a male may in later life marry a male or a female a female. Successful marital relations are of course impossible.

ATRESIA OF THE GENITAL CANAL

Atresia of the Vulva.—In the infant an inflammatory process may seal the labia minora together by a membrane. The membrane in such cases is thin and it is usually incomplete in front. It is easily divided by scissors or even by the finger.

Atresia of the Vagina

Etiology.—This is usually a *congenital* condition and is due to an imperfect canalisation of the lower end of the Müllerian duct, which thus fails to open into the urogenital sinus. In such cases there is a thin septum closing the vaginal orifice just above the lips of the hymen. In other cases there may be an absence of vagina in whole or part.

Closure of the vagina may be *acquired.* Ulceration of the lower end of the vagina may result in cicatricial closure.

The **clinical features** of atresia are *concealment of menstruation.* The molimina of menstruation are present, but there is no vaginal discharge. The flow is dammed back by the septum and distends the vagina to produce a haemato-colpos. In time distension of the cervix (haemato-trachelos) or of the uterine body (haemato-metra) takes place. In some cases a backward influx into the tubes causes a haemato-salpinx (Fig. 146).

Atresia of the vagina should be suspected in a young girl in whom menstruation is unduly delayed, and in whom there are monthly suggestions of an impending function in the shape of pain in the back or lower abdomen.

Where there is a thin septum blocking the vulvar outlet, the accumulating blood bulges it downwards and the condition is easily recognised on examination.

A large haemato-colpos may form a swelling in the lower abdomen on the summit of which the uterus may be perched.

The **treatment** of an atresic vagina consists in opening through the septum and allowing the chocolate-coloured blood to escape. The dammed-up blood has the consistence and very much the appearance of treacle; it is free of clots. Strict asepsis is necessary and undue pressure on the abdomen is to be avoided because of the ease with which a Fallopian tube distended by blood may be ruptured.

Absence of part of the vagina requires a dissecting operation to open up the canal to allow the menstrual discharge to escape.

Complete absence of the vagina is usually associated with a shrivelled uterus and complete amenorrhoea, so that an operation for the above purposes is not required. In a married

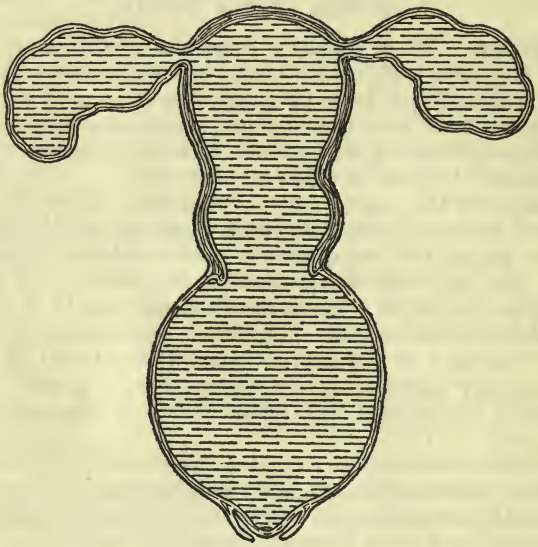

FIG. 146.—Atresia of the lower end of vagina.
Concealed menstrual accumulation distending the genital canal.

woman the construction of a vagina may be attempted by a dissection in the space between bladder and rectum. The canal thus made is prevented from closing up by the grafting of skin on its wall.

The fantastic procedure of bringing down a loop of small gut, separated from the intestinal canal but attached to its mesentery, has been suggested. After a space has been made for it, it is drawn down and fixed to the vulvar outlet and opened some days later.

Atresia of the Cervix.—Complete closure of the cervix may be *congenital.* The more common condition is *acquired* and is due to the accidental closure of the canal by the stitches during the operation of repair or amputation of the cervix. Sometimes the atresia is due to cicatricial contraction after the operation.

The *symptoms* and *signs* consist of concealed menstruation with the production of *haematometra* and perhaps haematosalpinx.

The *treatment* consists in opening up the cervical canal. If this is impossible hysterectomy is necessary.

Atresia of the Fallopian Tubes.—This is commonly an acquired condition caused by salpingitis. Complete closure of the fimbriated end is a common sequel of tubal inflammation (*q.v.*).

SECTION IX
OPERATIVE GYNECOLOGY

CHAPTER XXXVI

VAGINAL AND VULVAR OPERATIONS

Technique.—The technique of gynecological operations differs in no important respect from that practised in general surgery.

In vaginal and vulvar operations thorough preliminary

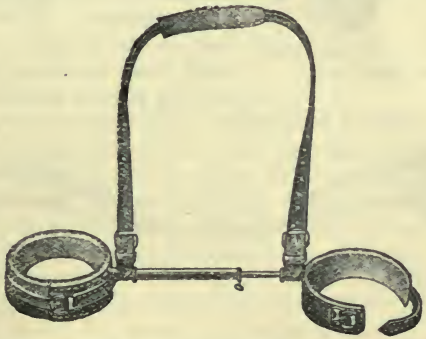

FIG. 147.—Clover's crutch—for fixing legs in the lithotomy position.

cleansing of the surfaces is required. This is especially necessary where there is associated infection of the genital canal. Vaginal douching night and morning for two days before the operation is carried out. The day before, the vulva

and pubis are shaved, whilst just before the operation, after a final cleansing, the vagina and vulva are swabbed with tincture of iodine. Where there is acute infection or a chronic infective process associated with a purulent discharge which does not clear up with douching, plastic operations on the genital tract are contra-indicated. Operative interference is very apt to awaken an infection to dangerous proportions, apart from the fact that wounds made under such circumstances are little likely to heal cleanly.

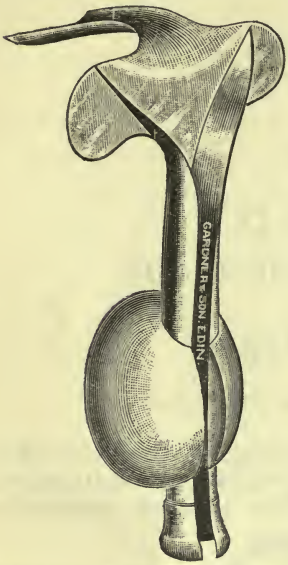

FIG. 148.—Auvard's self-retaining vaginal speculum.

Attention to the bowels is important before a gynecological operation. The usual purgative dose should be given two days before. The final clearing out is obtained by an enema administered on the night before the operation. Where an operation in the neighbourhood of the anal canal is contemplated, it is well to give in addition a quarter of a grain morphia suppository. This quietens the bowel and

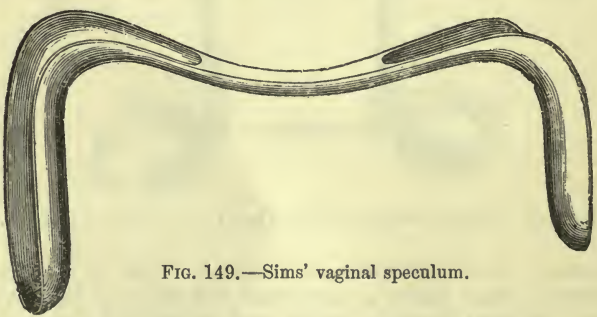

FIG. 149.—Sims' vaginal speculum.

prevents the disturbing peristaltic action which may, during

the operation, bring down foecal matter into the region of the wound. This precautionary measure is necessary before a perineorrhaphy.

The *bladder* should be emptied by catheter before every gynecological operation.

The *position* adopted for an operation on the vagina or vulva is the lithotomy position, with the skin surfaces covered by towels, and leaving only a gap sufficiently large for access to the vaginal outlet.

The *instruments* used depend on the operation. For access to the vaginal cavity the Auvard self-retaining speculum (Fig. 148) is employed in married women, the Sims' speculum (Fig. 149) in virgins. In addition a long speculum for drawing aside the lateral or anterior vaginal walls may be valuable.

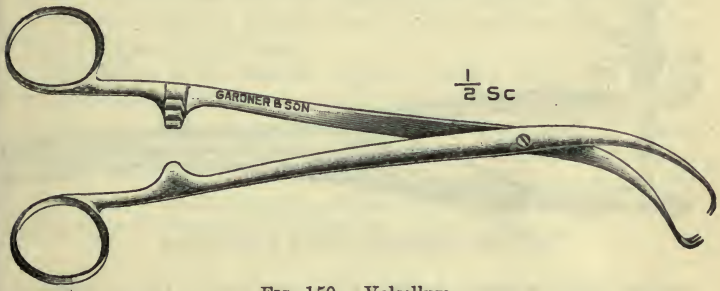

FIG. 150.—Volsellum.

Volsellum (Fig. 150).—This is a sharp forceps with curved teeth for grasping the cervix and pulling it down for examination or operation. In an ordinary case the cervix can be seized without causing pain, and it can be drawn down to a slight extent without producing much discomfort to the patient. In operations on the uterus (curettage, repair of the cervix, etc.) the cervix is pulled down to the level of the vaginal orifice with ease. In cases of prolapse it can be drawn out further. Fixation of the uterus, preventing its being pulled downwards to the level of the vaginal orifice, denotes either inflammatory adhesions in the pelvis or tumour—*e.g.* cancer of the cervix or fibromyoma.

Cervical Dilators.—These are used for expanding the cervical canal, when exploration of the uterus with a curette or the

finger is desired. They are of two kinds, graduated metal dilators and expanding dilators.

Graduated dilators (Fig. 151) are pushed into the cervix in

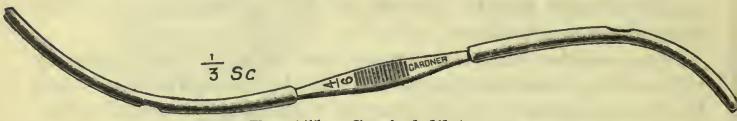

Fig. 151.—Cervical dilator.

increasing sizes till the requisite amount of dilatation is obtained.

Expanding dilators (Fig. 152) have two or three blades. The instrument is introduced closed and gradually expanded by

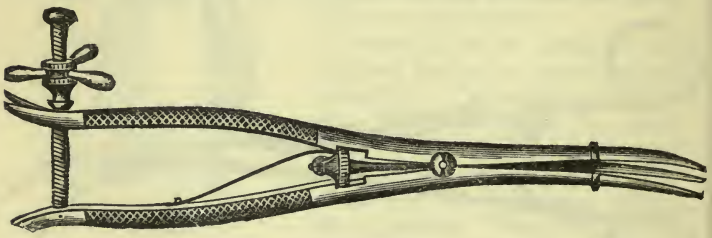

Fig. 152.—Expanding cervical dilator (Sims).

means of the running screw or by the hand. In some cases the smaller sizes of the graduated dilators are necessary to commence the dilatation before the expanding dilator can be received by the cervix.

Curette (Fig. 153).—This is a sharp elongated spoon or a

Fig. 153.—Curette.

sharp loop for scraping away the mucous membrane of the uterus either for exploratory purposes or for treating a uterus possessing a diseased mucosa. The " scrapings " removed are submitted to microscopic investigation for the detection of gestation products, inflammation, or tumour growth.

It is important that any tissue intended for microscopic

examination should be put into fixative solution (*e.g.* 4 per cent formalin) immediately. The common practice of shaking the material into a gauze swab, which is then rolled up for despatch to the laboratory, is to be condemned, because drying rapidly takes place and, moreover, the mucosa is so soft that damage readily occurs.

Where a curette is used for clearing away fragments of an incomplete abortion, it should be blunt. The figure (Fig. 155)

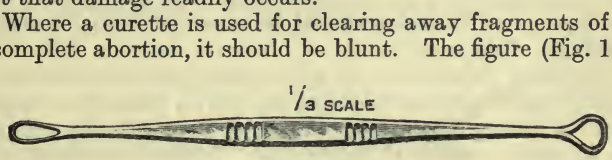

FIG. 154.—Loop curette.

shows a blunt curette, with a channelled handle, by means of which an irrigating douche can be run into the womb during the operation of curettage.

Dilatation of the Cervix.—This is carried out (1) as a cure for the dysmenorrhoea or sterility due to congenital narrowing of the cervical canal, as in congenital acute antiflexion ; (2) as a preliminary to curettage ; (3) to gain access to the uterus to remove tumours ; (4) to restore the canal narrowed after operation—*e.g.* amputation of the cervix. Dilatation may be carried out by mechanical dilators or by operation.

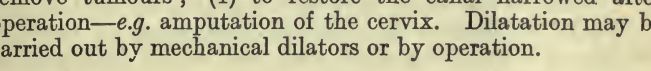

FIG. 155.—Flushing curette.

Mechanical Dilators.—The posterior vaginal speculum (Auvard's or Sims') having been introduced, the cervix is pulled down by two pairs of volsella placed, one in front, the other behind, the os externum. As a routine the sound is introduced to determine the length and position of the uterus. Graduated dilators (Fig. 151) are now pushed into the cervix. Beginning with the smallest of the series one can follow fairly rapidly in sequence. The first numbers enter easily as a rule, but in a nullipara, especially, a good deal of difficulty may be met with in the attempt to push the larger sizes past the internal os. The succeeding dilator should be introduced rapidly after the last before the cervical walls spring in by

their resilience. For more rapid dilatation, after the cervix has been opened up by the smaller sizes of graduated dilator, the Sims' three-bladed instrument may be used (Fig. 152).

The degree of dilatation required depends upon the condition present. For curettage, dilatation to number eight or ten is enough; for dysmenorrhoea, and for exploration with the finger, full dilatation should be practised, short of tearing the fibres of the cervix.

Operative Dilatation.—To give a more permanent dilatation than is possible by stretching of the cervix, some gynecologists prefer a cutting operation in cases of atresia of the cervix—*e.g.* in acute congenital anteflexion. *Dudley's operation* is in this class. Here the posterior wall of the cervix is split through from external to internal os by an incision along the midline. By introducing sutures in such a way as to fold each of the two raw edges on itself, a permanent gaping of the canal is procured, very similarly to the method adopted in a pyloroplasty operation on the stomach. Plastic operations of this nature on the uterus are of doubtful value.

Exploration of the Uterus.—This may be carried out by (1) the sound, (2) the finger, (3) the curette.

The uses of the sound have been described on page 53.

Digital exploration is commonly employed in obstetric practice for the recognition and removal of fragments of retained placenta or membranes, which are causing haemorrhage or fever. In gynecological practice the index finger is often employed for a similar exploration in cases of suspected retention of placental fragments and in mucous or fibroid polypi. Removal of a polypus can then often be carried out if it is seized with a forceps and twisted or cut from its attachment. Preliminary dilatation of the cervix is required as a rule in gynecological practice before the finger can be introduced. In other cases better access is obtained by a vertical incision carried upwards through the entire thickness of the cervix—*i.e.* hysterotomy (*q.v.*).

Curettage.—This consists of the scraping away of the mucous membrane of the uterus with a sharp spoon or curette.

Indications.—In the old days this operation was carried out with no definite underlying principle. Within recent years the indications have become crystallised under two headings, (*a*) diagnostic, (*b*) therapeutic. For purposes of *diagnosis* it

is employed to obtain the mucous membrane for microscopic examination in order to throw light on the cause of an intractable haemorrhage or discharge. In some cases chronic endometritis, mucous polypi, retained gestation fragments, or malignancy may be suspected. In such cases as haemorrhage due to subinvolution, fibromyomata, and fibrosis uteri, the

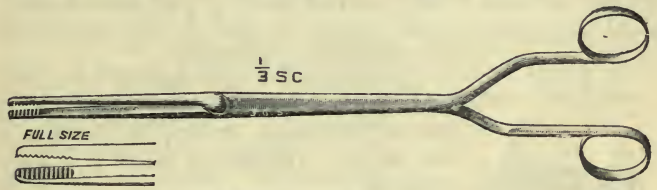

FIG. 156.—Uterine dressing forceps.

microscopic examination may reveal nothing of a positive nature. Here, however, the exclusion of the other causes of haemorrhage helps to further the diagnosis.

The reader's attention is directed to the precautions necessary for the proper safeguarding of the scrapings before their despatch to the laboratory (p. 291).

For purposes of *treatment* curettage is employed in cases of haemorrhage due to retained products of pregnancy, chronic

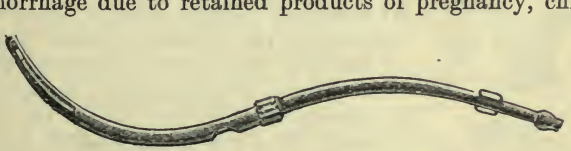

FIG. 157.—Uterine flushing catheter (Fritsch).

glandular endometritis, mucous polypi. Here the operation serves the double purpose of diagnosis and treatment. It is also sometimes used in cases of sterility, in the hope that the regenerated mucosa which grows will be more liable to accommodate an ovum. The operation is sometimes carried out for a similar purpose in women who have repeated abortions and in whom such conditions as syphilis can be excluded.

Technique.—After sufficient dilatation of the cervix has been carried out, the instrument is pushed gently upwards till it is arrested by the uterine fundus. It is then drawn down

firmly over the anterior wall and the mucosa removed in a long strip. This is shaken into a dish containing a fixative—*e.g.* 4 per cent formalin. The same process is carried out till the anterior, then the posterior uterine wall, and finally the lateral walls are denuded of mucosa.

The usual curettes are pictured in Figs. 153, 154, and 155. Where curettage is being carried out in a puerperal uterus a blunt instrument should always be used, as the uterine wall may readily be perforated.

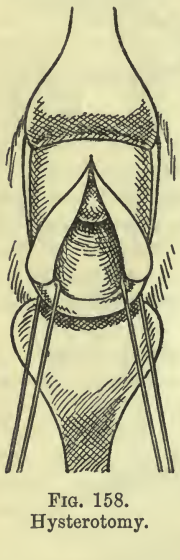

Fig. 158. Hysterotomy.

An antiseptic lotion carried on a swab held by a uterine dressing forceps (Fig. 156) is then used to wipe the interior of the uterus. Tincture of iodine is a useful material.

Hysterotomy.—This consists of a splitting open of the anterior wall of the cervix to give access to the uterus for digital exploration or for the removal of some growth,—*e.g.* submucous fibroid.

The cervix is held down by two volsella, whilst a transverse incision is carried across the front of the vaginal portion of the cervix just below the level of the bladder. By means of a swab, aided if necessary by the scissors, the mucosa is pushed upwards off the front of the cervix, carrying with it the bladder. A sharp-pointed straight pair of scissors are now used to slit the cervix upwards along the midline to the isthmus (Fig. 158). Free access to the uterine cavity is thus gained. At the end of the operation the cervix is closed up by a series of catgut sutures, after which the uplifted flap of mucosa is brought down and stitched in position.

Repair of the Cervix: Trachelorrhaphy.—This consists in the repair of a lacerated cervix. The repair may be unilateral or bilateral. Associated with the laceration there is usually so-called " erosion " of the adjacent mucosa.

The simplest type of operation is shown in Fig. 159. The edges of the lacerations are paired and reunited by strong catgut sutures. Firm apposition of the raw edges at the apical part of the laceration should be carefully obtained.

Failure to observe this precaution is apt to be followed by severe bleeding from the descending twigs of the uterine artery severed during the operation.

Amputation of the Cervix.—This is required for hypertrophic enlargement of the cervix. It is frequently necessary in operations for prolapse, in which condition, as we have seen, there is often an elongation of both vaginal and supravaginal cervix.

The *circular amputation* is not good, because of the impossibility of bringing the large circumference of the outer part of the cervix in to meet the small circle of mucosa of the canal.

Flap Amputation.—This consists in marking out two flaps, one in front and one behind. By doubling the apex of each flap into the canal of the cervix by appropriate sutures and then introducing a series of lateral stitches a good reconstruction of the cervix is gained (Fig. 160).

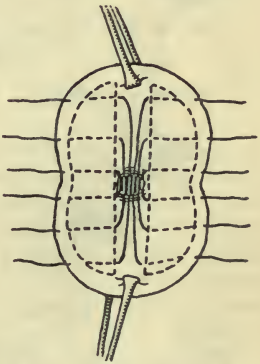

Fig. 159.—Trachelorrhaphy.

The amount of tissue removed depends on the degree of hypertrophy of the cervix. In a supravaginal amputation it is necessary, as a preliminary, to throw up the bladder. An incision is made across the front of the vaginal part of the cervix just below the bladder. A flap of mucosa containing bladder is then pushed up the distance required for the amputation. At the end of the operation the mucosa flap is brought down and stitched in place.

Two risks associated with the operation require mention. The first is atresia of the cervix due to accidental closure of the canal by the sutures during the operation or cicatricial closure at a later date. This is followed by amenorrhoea due to the retention within the uterus of the menstrual flow. If the cause is not recognised and treated, the distension of the uterus sooner or later causes pain in the lower abdomen, intensified at menstruation. Closure during the operation is obviated by the passage of the sound to ensure that the canal is clear.

Atresia discovered at a later date demands an operation for the reopening of the cervix.

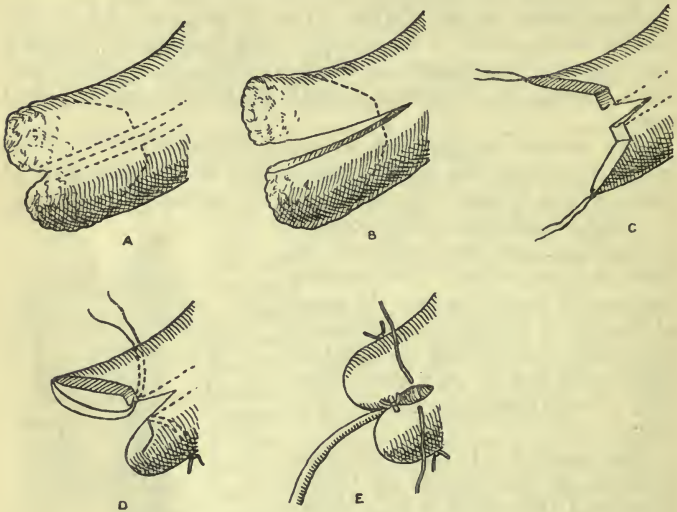

Fig. 160.—Amputation of the cervix.

The other risk, and it is now recognised to be of considerable importance, is that the shortening of the cervix tends to repeated miscarriages. To minimise this risk removal of too great a portion of cervix should be guarded against.

CHAPTER XXXVII

VAGINAL AND VULVAR OPERATIONS (*continued*)

SUPPORTING OPERATIONS FOR PROLAPSE OF UTERUS AND VAGINAL WALLS

Anterior Colporrhaphy consists of a tightening up of the anterior vaginal wall for cystocele.

The cervix is pulled down by two volsella and an ellipse of mucosa is dissected from the anterior vaginal wall commencing above, just below the urethra and terminating below, just above the external os. The bladder is stripped from the front of the cervix by blunt dissection and pushed upwards. Figs. 161 and 162 show a common method of carrying out these steps. One or more sutures are then placed across the upper part of the wound to bring the musculo-fascial layers together under the bladder. When tied, these firmly tether the bladder in the new position. A series of sutures now bring the deeper fascial and muscular layers together and a running suture apposes the edges of mucosa (Figs. 163 and 164).

Perineorrhaphy.—Repair of the perineum is frequently needed in gynecological practice. It consists in a reconstruction of the parts, which have been torn and stretched by labour.

The first step consists in the picking up of the tissue on each side with a pair of catch forceps about two-thirds of the way along the inner aspect of the labia minora (Fig. 165). The muco-cutaneous junction behind is split with a knife or a pair of perineal scissors (Fig. 171). The incision thus commenced is carried up on each side to the level of the forceps. This incision marks out a flap of mucous membrane on the posterior vaginal wall, which is uplifted by blunt dissection, aided by the

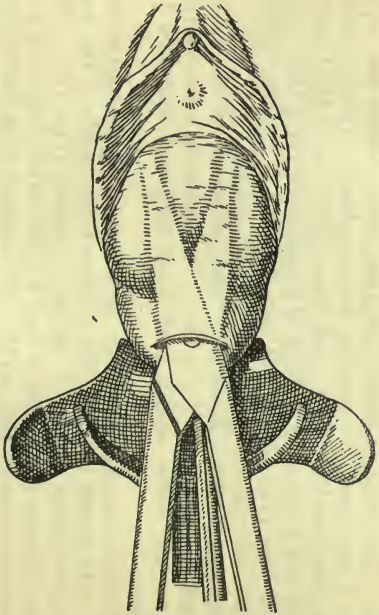

FIG. 161.—Anterior colporrhaphy. First stage.

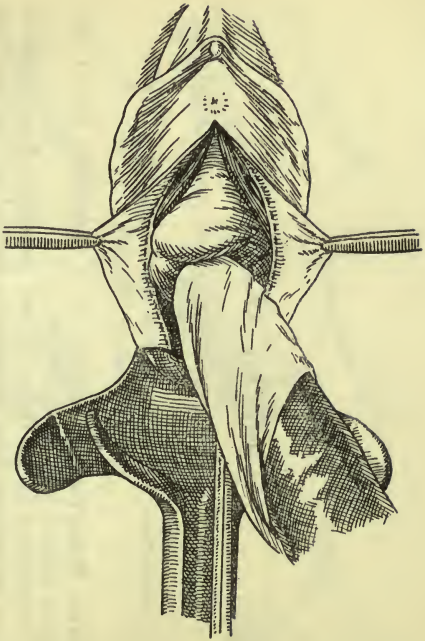

FIG. 162.—Anterior colporrhaphy. Second stage.

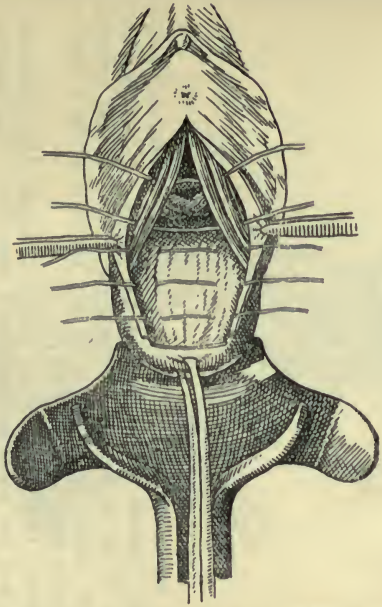

FIG. 163.—Anterior colporrhaphy. Third stage.

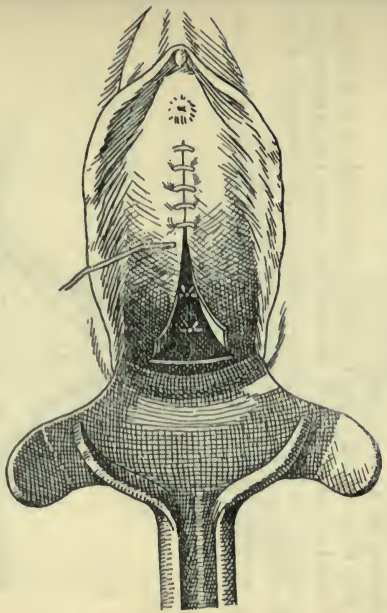

FIG. 164.—Anterior colporrhaphy. Fourth stage.

Note.—The stitching should be carried out from below upwards, and not, as shown in the figure, from above downwards.

snipping action of the scissors (Fig. 167). The proximity of the rectum has to be remembered and care taken to avoid button-holing its anterior wall.

The flap thus raised is held up by forceps and, in the depth of the wound on each side, the severed bellies of the levator ani are seen or they are felt if the two index fingers are hooked in and pulled downwards and outwards on each side.

Deep catgut sutures bring the levatores together in the

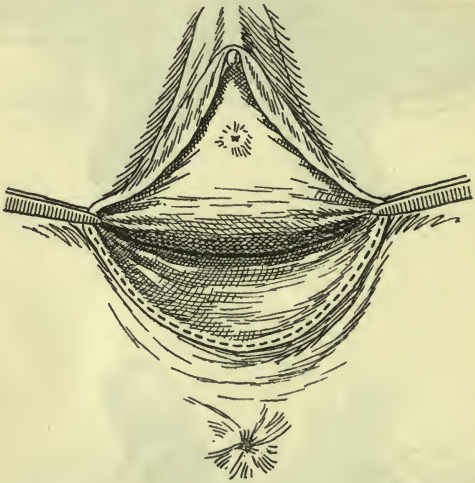

Fig. 165.—Colpo-perineorrhaphy. First stage.

midline across the front of the rectum. Thereafter the more superficial tissues are brought together by an intermediate stratum of two or three sutures, and then the skin and mucosa edges are united by a series of fine stitches or by a single subcuticular stitch (Figs. 168-170).

Posterior Colporrhaphy is required when the posterior vaginal wall has been prolapsed and stretched. The removal of a central strip of the redundant tissue allows of the tightening up of the wall. In many cases, in association with the prolapsed wall, there is a rectocele.

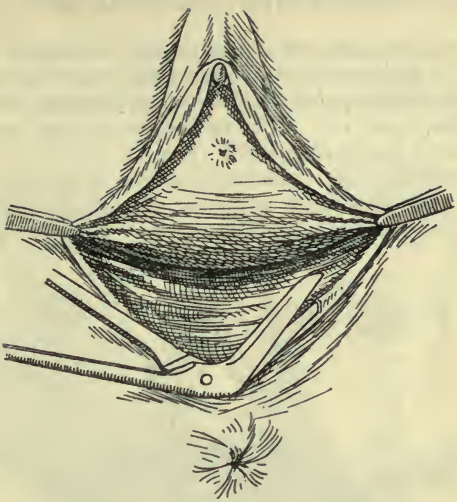

FIG. 166.—Colpo-perineorrhaphy. Second stage.

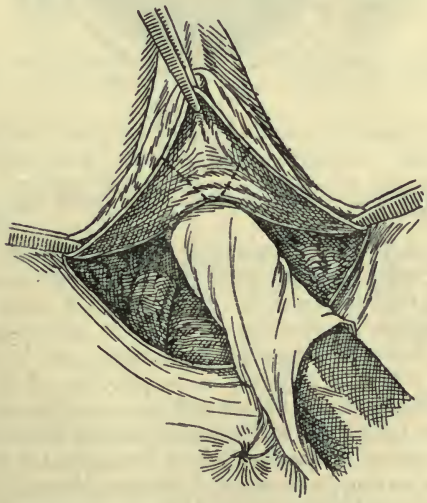

FIG. 167.—Colpo-perineorrhaphy. Third stage.

Ordinarily a posterior colporrhaphy is carried out in the course of a perineorrhaphy. After the posterior mucosa flap is uplifted a triangular section of appropriate size, with its apex above, is cut out. The two edges are then united across the midline by a running stitch (Fig. 169).

The extent of the operation required in prolapse varies in different cases depending upon the degree of evagination and stretching of the vaginal walls and the condition of the peri-

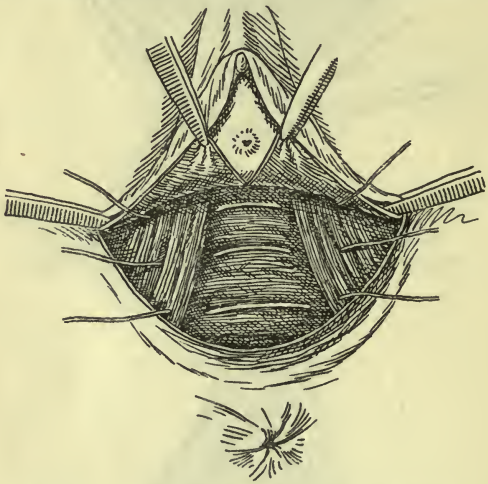

FIG. 168.—Colpo-perineorrhaphy. Fourth stage.

neum. In slight cases, associated only with some cystocele, an anterior colporrhaphy, with or without a minor perineal repair, is all that is required. In aggravated cases a multiple plastic procedure, consisting of anterior and posterior colporrhaphy and an extensive perineorrhaphy is demanded. In addition a trachelorrhaphy or amputation of the cervix is required in many cases, for, it will be remembered, prolapsus uteri is often associated with hypertrophy of the cervix.

It is a matter of discussion how far a plastic operation is successful in curing prolapse, and, in many clinics, it is maintained with considerable reason that an abdominal operation

to fix the uterus from above should be practised as a routine in at least all aggravated cases of prolapse.

Perineorrhaphy for Complete Laceration into Rectum.—The

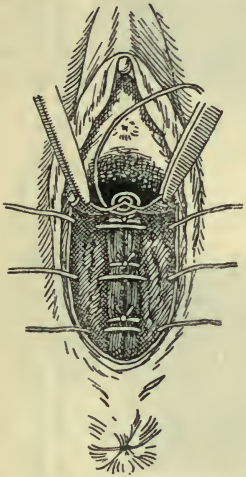

Fig. 169.—Colpo-perineorrhaphy. Fifth stage.

Fig. 170.—Colpo-perineorrhaphy. Sixth stage.

general steps of this operation are similar to those of an ordinary perineorrhaphy, but some details are different. The laceration has torn through the perineal body into the rectum and

Fig. 171.—Perineorrhaphy scissors.

between this canal and the vagina there is only a thin septum. The lines of the incisions are shown in Fig. 172. A flap is first lifted up from the posterior vaginal wall. A series of sutures are so placed on the anterior margin of the rectal orifice as to double this margin on itself and thus prolong downwards the

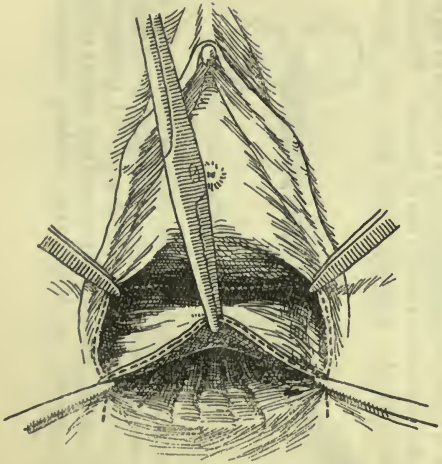

FIG. 172.—Operation for complete tear of the perineum. First stage.

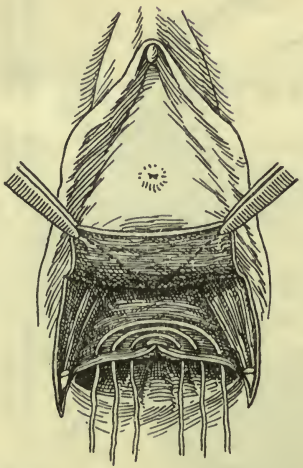

FIG. 173.—Operation for complete tear of the perineum. Second stage.

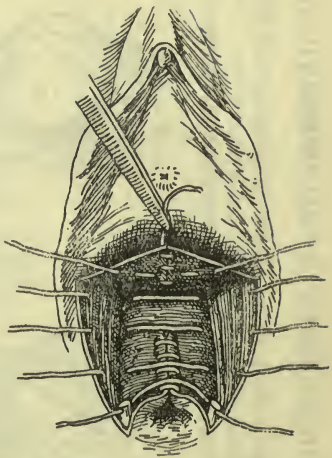

FIG. 174.—Operation for complete tear of the perineum. Third stage.

rectum, which, when the stitches are tied, is contracted at its lower end into a narrow orifice. The severed ends of the anal sphincter, which were naturally thrown apart at the time of the original tear, are then drawn together across the front of the new anus. The closure of the remainder of the wound is exactly as for an ordinary perineorrhaphy. If a posterior colporrhaphy is required, a triangular portion, as marked out

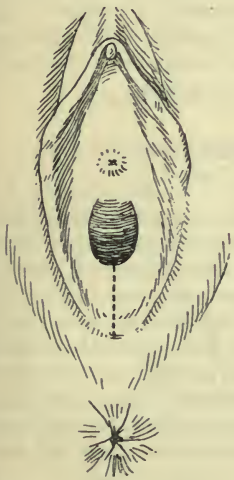

FIG. 175.—Operation for expanding vaginal outlet. First stage.

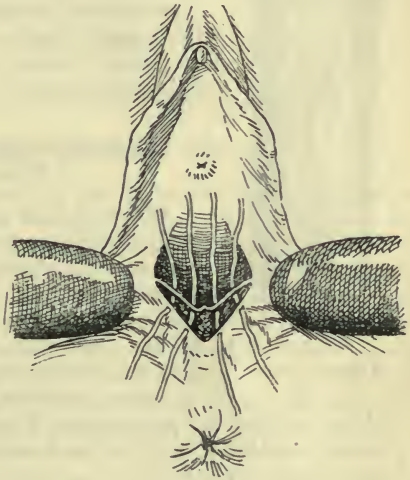

FIG. 176.—Operation for expanding vaginal outlet. Second stage.

in dotted lines, is excised exactly as described in an ordinary colpo-perineorrhaphy (Figs. 173, 174).

Interposition Operation for Prolapse and Cystocele.—This is an operation not held in general favour.

After a transverse incision has been made across the front of the cervix below the bladder, the mucous membrane and bladder are pushed up to the level of the isthmus of the uterus. The utero-vesical pouch of peritoneum is opened and the uterus, which is forcibly anteverted, is pulled through the opening, so that the fundus projects into the vagina. The peritoneum is

stitched circumferentially round it where it emerges from the peritoneal cavity. The fundus is then covered by the anterior vaginal wall.

This operation is successful in curing cystocele and many cases of prolapse. The distorted position which the uterus is made to assume makes it inapplicable to women before the menopause unless, as some surgeons recommend, a preliminary sterilisation is practised. In the greatly displaced position of the uterus pregnancy would be attended by grave risks of rupture of the uterus.

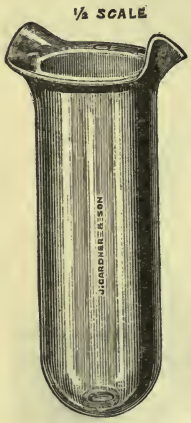

Fig. 177.
Vaginal dilator.

Operation for Vaginismus and Dyspareunia

Where due to undue contraction of the vaginal orifice these conditions are best treated by plastic operation. A longitudinal mesial incision is carried through the lower posterior vaginal wall and front of the perineum. The vertical wound thus made is retracted laterally and stitched up as a transverse wound (Figs. 175-176).

After healing, the patient should be instructed to introduce a vaginal dilator (Fig. 177) for twenty minutes daily till the functions are normal.

CHAPTER XXXVIII

VAGINAL AND VULVAR OPERATIONS (*continued*)

VAGINAL HYSTERECTOMY

THE operation of removal of the uterus by the vaginal route has become less and less frequent within recent years with the increasing favour given to abdominal hysterectomy. It is now practically never employed for cancer, for the lower route does not give opportunities for the extirpation of the surrounding connective tissue and glands by dissection, which are afforded by the abdominal route. Vaginal hysterectomy is still occasionally employed for fibromyomata of small size, and fibrosis uteri. The vaginal operation is associated with less shock, and it is, therefore, better adapted for patients enfeebled by severe haemorrhage, or cardiac or Bright's disease.

Technique.—In the lithotomy position, the posterior vaginal wall being held back by a self-retaining speculum, the cervix is pulled down by two volsella. The lower limit of the bladder having been noted, a circular incision is carried through the mucosa of the vaginal part of the cervix just below the bladder. By pushing up the mucosa and bladder from the front of the cervix the utero-vesical pouch of peritoneum is reached. It is seized and opened by a pair of scissors. By stretching the opening thus made the uterus is separated from the peritoneum in front. The mucous membrane is pushed up all round the cervix in the form of a cuff. The peritoneum of the pouch of Douglas is opened and the uterus separated from the peritoneum behind.

The uterus is pulled down firmly and drawn to one side by means of the volsella, and the parametric tissue along the side

of the cervix is divided between a clamp placed on the inner side and a transfixing ligature on the outer side. The entire length of the parametric tissue and broad ligament on each side is thus divided off from below upwards between an ascending series of clamps and ligatures thus placed. As the uterus is freed partly on one side it is pulled over to the other side and the severance continued there, and so the separation is continued from side to side till it is complete. At the level of the isthmus the uterine vessels are divided, whilst at the upper margin of the broad ligament the ovarian vessels, tube, and round ligament are divided.

At the end, the utero-sacral ligaments on each side are divided between a clamp and ligature.

The proximity of the ureter to the lateral aspect of the supravaginal cervix has to be kept in mind; it is distant at the farthest only about three-quarters of an inch.

If the tubes and ovaries require removal, the infundibulo-pelvic ligament is separated on each side close to the pelvic wall.

To strengthen the vaginal vault and prevent herniation of bowel, it is well to tie the broad ligaments and utero-sacral ligaments across the midline at the end of the operation.

The special dangers encountered in vaginal hysterectomy are damage to bladder, ureter, or small bowel, and haemorrhage. Damage to bladder may occur with too forcible attempts at blunt dissection, when the organ is being lifted off the cervix. Injury to the ureter is avoided by making the division of the parametric tissue close to the cervix. The bowel may be damaged if a knuckle of small intestine escapes unnoticed through the vaginal vault and enters the vagina. To prevent this, a swab held by a tape should be pushed into the peritoneal cavity when the pouch of Douglas is opened. Haemorrhage is prevented by careful haemostasis during the operation, every bleeding point being grasped by ligature. Deep-seated bleeding from the vaginal vault, where an encircling ligature cannot be placed, should be treated by a catch-forceps, which is left on the bleeding area for twenty-four hours. The handles are surrounded and supported in the vagina by a length of sterile gauze.

Operations for Vaginal Fistulae

Vesico-vaginal fistula, which is due to cancer of the cervix, is, of course, inoperable. When due to trauma—*e.g.* labour, it is best treated by a plastic operation. The patient is placed in the lithotomy position with the posterior speculum introduced, and the cervix is drawn down with a volsellum. If the fistula is difficult to recognise, sterile milk injected into the bladder by means of a Higginson's syringe trickles into the vagina along the fistulous track, which then becomes apparent.

The edges of the fistula are pared in a bevelled manner. More material is removed from the vaginal aspect. The hole is then closed up transversely by a series of stitches passed from side to side. These should not be passed through the vesical mucosa, for stitches introduced into the bladder are apt to cause trouble from the phosphatic concretions that gather on them.

The chief cause of failure in this operation is tension on the

Fig. 178.—Self-retaining catheter.

stitches. For this reason, if the anterior vaginal wall is tight in the area of the fistula and there is any danger of the sutures cutting through, the vaginal mucosa and some of the underlying fibro-muscular tissue on each side should be lifted up as a flap. The undermined tissue is then drawn easily over the underlying fistula.

Another cause of failure is pre-existing infection of the bladder. Before the operation, therefore, it is necessary to cure any cystitis present.

Continuous drainage of the bladder by the introduction of a self-retaining catheter (Fig. 178) is carried out until the wound in the vaginal wall has healed.

Recto-vaginal Fistula.—This, like vesico-vaginal fistula, is due to damage at labour. It is most commonly present low down on the posterior vaginal wall, when it is closed up during the colpo-perineorrhaphy required for the associated damage of the perineal body and pelvic floor. If at a higher level in

the vagina it is closed in a manner similar to that employed in the case of vesico-vaginal fistula.

Fistulae due to cancer are inoperable.

Uretero-vaginal fistula is due usually to an accidental damage of the ureter during a hysterectomy for cancer of the cervix or cervical fibromyoma. If the damage is noticed during the abdominal operation the severed ends of the ureter may be anastomosed or the proximal end may be transplanted directly into the bladder. When recognised only at a later date, the abdomen has to be opened, when transplantation may be attempted, or the kidney on the corresponding side may be excised, if previously one has assured oneself, by segregating the urine, that the opposite kidney is functioning completely.

CHAPTER XXXIX

ABDOMINAL OPERATIONS

Technique.—Before an abdominal operation the patient should rest for at least one day in bed. This gives an opportunity for thorough cleansing of the operation area. Examination of the heart, urine, etc., is carried out as before any operation.

Except in emergency operations, cleansing of the abdominal skin is carried out usually on the afternoon before the laparotomy. In addition, the pubis and vulva are shaved and cleansed and a cleansing vaginal douche is given, so that if the occasion arises the vaginal vault may be opened without the risk of infection. Opening of the vagina is necessary as a matter of course in complete hysterectomy. It is often required, also, when drainage of the pelvis through the vagina is a desideratum.

Clearing out of the bowel is obtained and it is important that the *bladder be emptied by catheter* in every case.

The position of the patient adopted for an abdominal operation is the ordinary dorsal posture. During any manipulative procedure in the pelvis the Trendelenburg position is employed. Here the operating table is tilted so that the patient's head is lowered. In this position the intestine gravitates towards the diaphragm from the pelvis. If the anaesthesia is satisfactory and the bowel is well packed off, free exposure of the pelvic contents is thus obtained.

FIXATION OPERATIONS OF THE UTERUS

These are carried out for (1) retroversion and retroflexion, and (2) prolapse. In the latter, the abdominal fixation is carried out as an adjuvant to a vaginal plastic procedure.

Shortening of the Round Ligaments

Alexander-Adams Operation.—This operation does not necessitate opening of the peritoneal cavity and it is therefore unassociated with the risks of a laparotomy. It is carried out specially for cases of mobile retroflexion and retroversion and also as a means of greater or less value of strengthening the upper supports of the uterus in cases of prolapse. In such cases it is auxiliary to a plastic operation carried out below.

The operation consists in exposure of the external abdominal ring on each side by means of a single transverse incision or by two incisions made as for double inguinal hernia. The round ligament is isolated and pulled forwards from the inguinal canal for two or three inches. During its forward traction a pouch of peritoneum is usually drawn with it and has to be stripped backwards. The ligament is stitched in its new position to the external ring and the redundant piece on each side cut away.

The disadvantages of the operation consist, in the first place, in an anatomical uncertainty. Sometimes the ligaments are so thin that they are impossible to recognise, or they tear during traction. In the second place, it gives no opportunity for the treatment of disease of the appendages or pelvic adhesions, which are, as we have seen, often associated with retrodeviations of the uterus, and which, in point of fact, are the factors that usually explain the symptoms present in these displacements.

Gilliam's Operation.—Here the abdomen is opened by an ordinary mesial incision. Any operative treatment required on account of appendage disease is done and any adhesions binding back the uterus are dealt with. The round ligament on each side is encircled with a ligature about 1½ in. from the uterus, and the ends of the ligature are secured with forceps. A small incision is now made in the aponeurosis in front of the rectus muscle about 1½ in. from the midline. A long straight pair of forceps is passed into this opening and driven through the entire thickness of the muscle, fascia, and peritoneum of the abdominal wall. Traversing the peritoneal cavity it seizes the ligature encircling the round ligament. It is then pulled forwards, and a loop of round ligament is thus delivered through the abdominal wound and is fixed to the fascia over the rectus.

The same procedure is done on the other side, with the result that the two round ligaments are drawn forward across the peritoneal cavity and pass through an adventitious canal in the abdominal wall.

The disadvantage of this operation consists in the two bands formed by round ligament on each side, which traverse the peritoneal cavity, and round which there is always a subsequent risk of bowel becoming kinked. For this reason a modifica-

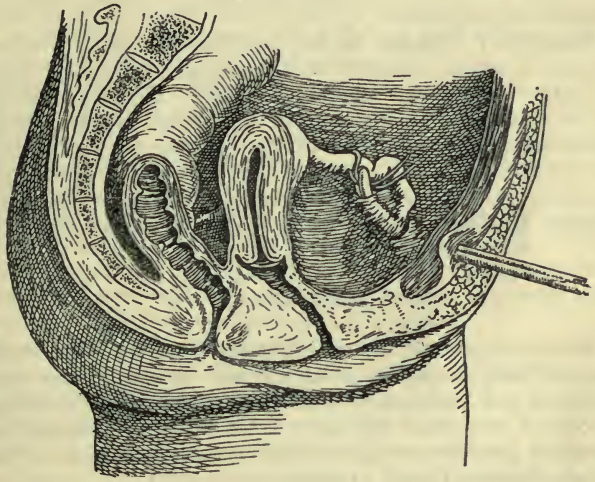

FIG. 179.—Gilliam's operation for shortening the round ligaments. (After Graves.)

tion of the operation, which avoids this danger, is better. Here the forceps which transfix the abdominal wall are curved. They are pushed obliquely through the rectus towards the deep inguinal ring. Instead of perforating the peritoneum they are insinuated along the course of the round ligament extraperitoneally and only perforate the peritoneum when the ligature encircling the round ligament is reached This is seized and, when they are withdrawn, they deliver the ligament along an extraperitoneal channel (Fig. 179).

Ventral Fixation of the Uterus.—Here the uterus is brought

forward and fixed by its peritoneal surface to the peritoneum of the anterior abdominal wall by a series of sutures. Some operators fix the uterus at the level of the fundus, others along its anterior wall. Subsequent to the operation peritoneal bands, sometimes of considerable length, form, and then there is always present the risk of internal strangulation of bowel.

The operations, which consist of a shortening of the round ligaments, or of a fixation by peritoneal surfaces only, do not prevent, as a rule, the normal expansion of the uterus during a subsequent pregnancy.

There still remains to be mentioned a further class of operation, which consists in an embedding of the uterine body in the anterior abdominal wall. Here pregnancy is apt to end either in abortion or in uterine rupture, because expansion is only possible at the expense of the posterior, free wall. For these reasons such fixation procedures are available only after the menopause or after sterilisation of the patient. Such operations are rarely practised now.

Myomectomy

This consists in the enucleation of a fibro-myomatous tumour from the uterus in an attempt to restore the normal condition and function of this organ. It is specially adapted for one or two small subserous tumours of the uterine body, though it has been employed for the removal of more deep-seated growths of body or cervix.

An incision is made across the summit of the neoplasm through the covering tissues. The tumour is peeled out, after which the uterine wound tends to close spontaneously by virtue of the contraction of the muscle. A series of deep sutures are introduced to close the cavity, and the peritoneum is united by a fine stitch.

The operation is only justified in the case of comparatively young women, in whom a conservative effort is desirable, to retain the uterus for pregnancy. It is attended with greater risks than a hysterectomy, the risks increasing in proportion to the amount of uterine damage entailed in the operation. Haemorrhage and sepsis are the chief dangers.

ABDOMINAL HYSTERECTOMY

Indications.—Removal of the uterus may be required for disease of the uterus itself or for disease of the appendages or broad ligament. In the case of malignant disease of the tubes, ovaries, or broad ligament, removal of the womb is necessary in the interests of a radical operation. In the case of inflammation or simple new growth in these regions, extirpation of the uterus is often required, because it is severely infected itself or because it is so intimately adherent that a clean operation demands the sacrifice of the uterus.

Uterine Disease.—Hysterectomy is often necessary for a *tumour growth*: fibromyoma, cancer, sarcoma, chorion-epithelioma. It is sometimes required for *infection*: puerperal infection, chronic metritis, tuberculosis. Rarely it is employed for *displacement*: inversion, prolapse.

Tubal or Ovarian Disease.—*Tumours—e.g.* papillomatous cystadenoma and malignant tumours of tube and ovary necessitate a hysterectomy. Some cases of *infection—e.g.* a bilateral adhesive salpingo-oöphoritis, require hysterectomy. So occasionally in *tubal pregnancy* it is necessary.

Broad ligament tumours sometimes strip the peritoneum so widely from the uterus that a hysterectomy is required.

Varieties.—(1) Subtotal hysterectomy: here the body of the uterus is removed at the level of the isthmus. This is the operation frequently used for fibromyoma and for inflamed appendages. (2) Total hysterectomy: here the whole uterus is removed from the vagina. This is the operation employed in all cases of malignancy and in cases of fibromyoma involving the cervix.

Subtotal Hysterectomy

The abdominal cavity having been opened, the gynecologist investigates by hand and by sight the conditions present in the pelvis. This enables him to determine the extent of the operation required and whether the tubes and ovaries on one or both sides have to be sacrificed. In a young woman it is important to conserve the ovaries if possible.

The uterus is drawn up towards the wound; if there is a fibromyoma this is usually easy. In such cases the womb may

actually be delivered completely from the abdomen. Some fibromyomatous tumours are so fixed in the pelvis, that the myoma screw (Fig. 180), used like a corkscrew, is employed to pull the uterus up.

The upper margin of the broad ligament on one side between the ovary and the uterus is seized with two clamp forceps and divided with scissors. This cuts through the tube and the ovarian vessels. If the tubes and ovaries have to be removed, the division is carried through the infundibulo-pelvic ligament. The round ligament is divided between forceps close to the uterus.

The same division of structures is carried out on the other side. The peritoneum is then divided across the front of the uterus from round ligament to round ligament, and a flap of peritoneum is pushed off the front of the body and cervix, carrying bladder with it.

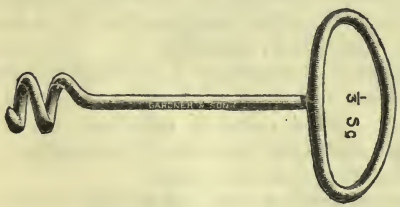

FIG. 180.—Myoma screw.

The uterine vessels are divided between forceps, first on one side then on the other, after which the uterus is sliced across at the level of the isthmus.

The three sets of clamps on each side holding the upper margin of the broad ligament, the round ligament, and the uterine vessels are replaced by ligatures, and, in each case, to make the grip stronger, the ligature should be passed through the adjacent tissues by means of an aneurism or pedicle needle. This precaution minimises the risk of the slipping of a ligature, an accident which may be attended by fatal consequences.

At this stage of the operation a transverse gaping wound in the peritoneal lining of the pelvis exists. This wound is closed by means of a long stitch which runs across from one side to the other, bringing the peritoneal edge behind to the peritoneum in front. At each end of the wound the stumps of broad ligament and round ligament are buried.

The pelvic cavity is freed of clots by swabs, a final glance is given to see that there is no oozing, the large abdominal packing swabs are removed, and the abdomen is closed.

Total Hysterectomy

The steps in this operation are as for subtotal hysterectomy up to the division of the uterine vessels between clamp forceps.

The utero-sacral ligament on each side is divided between clamp forceps, and the peritoneum is incised across the back of the uterus from one divided ligament to the other. A peritoneal flap is pushed off the back of the cervix and the upper part of the vagina, and from this region of the vagina the rectum is separated.

The bladder in front is separated completely from the cervix, and it is stripped downwards off the upper part of vagina. The anterior wall of vagina is now opened at its upper end. A curved volsellum forceps is introduced into the hole thus made and the vaginal portion of the cervix seized and pulled forcibly upwards and forwards. The vagina is next divided all round the cervix and the uterus is freed from its final attachment.

A stitch is immediately passed through each side of the divided vagina to control the vaginal vessels.

After the clamp forceps, which have been employed, have been replaced by ligatures, the two peritoneal flaps are brought across to cover the pelvic floor as in the subtotal operation.

Total Hysterectomy for Carcinoma of the Cervix (Wertheim's Operation)

In its general lines this operation resembles total hysterectomy, the details of which have just been described. The operation for cancer of the cervix, however, is much more radical. It aims at a wide removal of the pelvic cellular tissue extending from uterus to side wall of pelvis with the object of removing any infiltration, which, as we have seen, is apt to occur along the lymphatics and along the connective tissue planes. It aims also at the extirpation of the pelvic glands. In addition, a cuff consisting of the upper part of the vagina is removed, with the cancerous cervix shut inside it throughout the whole course of the operation. In this way one avoids the risk of the necrotic cancerous area sowing cancer cells and infection broadcast over the wound during the manipulations.

The infundibulo-pelvic ligaments and round ligaments are divided off and the peritoneal flap, including the bladder, pushed off the front of the cervix and vagina. The ureters are then recognised on each side and dissected out as far forwards as the bladder. This is done so that the cellular tissue can be dissected out without the risk of the ureters being damaged. The uterine vessels are divided close to the side wall of the pelvis and are thrown inwards towards the uterus. This is a

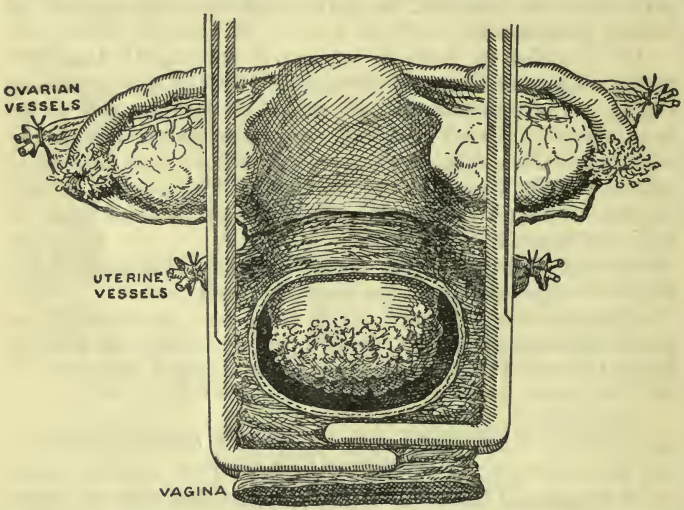

FIG. 181.—Complete hysterectomy for cancer of cervix.

necessary step in the exposure of the ureter on each side. At this point a lymphatic gland is often visible and is removed.

The utero-sacral ligaments are divided behind and the peritoneum is separated from the back of the cervix and vagina. By pushing off the rectum behind and the bladder in front the surgeon frees a considerable area of the upper part of the vagina, inside which the solid cancerous growth can be felt. A pair of curved clamps are placed across the vagina from each side and this structure is divided below the clamps (Fig. 181).

The lateral margins of the lower end of the vagina are

grasped with forceps and a stitch is introduced to control the vaginal vessels.

As much cellular tissue is removed from the side wall of the pelvis as possible, and the glands lying along the iliac vessels are dissected away. Finally, the pelvic floor is covered over by the apposition of the anterior and posterior peritoneal flaps.

This operation is a severe one, and it is only available for comparatively early cases of cancer of the cervix. If the bladder or rectum are found to be involved when the abdomen is opened the operation must be desisted from.

In the hands of an experienced operator the final results of the operation are passably good. Some operators have recorded as great a proportion of ultimate cures as 30 or 40 per cent.

Ovariotomy

This means the removal of an ovary which is enlarged by tumour growth. In simple cases the tumour is usually freely mobile, and its extirpation constitutes one of the easiest operations in gynecology. Here one ovary alone usually requires removal, though in some instances the tumour growth is bilateral. In an otherwise simple tumour such complications as torsion or infection may make its removal difficult because of adhesions. In malignant cases and in papillomatous tumours the operative treatment includes a removal of the uterus and the tubes and ovaries on both sides.

Technique.—The abdominal wall is opened by an incision large enough to allow of complete delivery of the tumour. In the case of cystic tumours, the loculi may be emptied by a trochar and cannula (Fig. 131), and by this means a large tumour can be removed through a small wound. Despite every effort, however, to protect the peritoneal cavity, the cyst fluid may trickle back and cause peritoneal infection or the condition already described as pseudomyxoma peritonei. For these reasons tapping should be reserved for feeble or aged patients, in whom the avoidance of post-operative shock is of paramount importance.

After the tumour is delivered, the pedicle is divided between two pairs of stout clamp forceps and the tumour is removed. The proximal end of the pedicle is transfixed by a strong ligature, which first embraces one half and is then carried

round the whole pedicle, the clamp forceps being gradually loosened as the ligature is drawn tight. To avoid a raw area the peritoneum should be drawn over the end of the pedicle by means of a fine stitch before it is dropped back into the pelvis.

Before closing the abdomen the surgeon must examine the other ovary.

Oöphorectomy.—By this is meant the removal of the ovary for such local conditions as inflammation, ovarian pregnancy, or tubal pregnancy in which the ovary is densely adherent. Bilateral oöphorectomy is also practised for the cure of osteomalacia.

Technique.—The ovary having been separated from adhesions, where these are present, the tissue attaching the ovary to the broad ligament is clamped and divided on the ovarian side. The clamp is replaced by a transfixing ligature, and the stump thus left is covered over by a peritoneal hood drawn from the adjacent broad ligament.

Resection of the Ovary.—This consists in the removal of diseased (*e.g.* cystic) portions of ovary. It has been discussed on page 166.

Salpingectomy.—By this is meant removal of the Fallopian tube for such conditions as tubal pregnancy and inflammation. Excision of the tubes or of a portion of each tube is the best way to sterilise a patient.

The broad ligament is pulled up towards the abdominal wound. A pair of forceps is placed on the uterine end of the tube and another on the infundibulo-pelvic ligament just outside the fimbriated end. The tube is cut out of the upper margin of the broad ligament between these points. The two forceps are replaced by ligatures after which the broad ligament is closed by a continuous fine suture. At the inner end the nose of the ligated tube and at the outer end the stump formed of ovarian vessels are buried within the layers of the broad ligament.

Salpingo-oöphorectomy.—Removal of the tube and ovary on one or both sides is often necessary for salpingo-oöphoritis, and for tubal pregnancy.

Adhesions are commonly present, and these have to be separated before the organs are free for removal. The separation of such adhesions is often very difficult, and careful pro-

tection of the surrounding peritoneal surfaces is necessary to avoid contamination with infective material in the case of salpingo-oöphoritis.

The infundibulo-pelvic ligament at the outer aspect is grasped by forceps. Another forceps grasps the inner end of the tube and the ovarian vessels, and a third forceps clamps the ovarian ligament. The appendages are cut away between the two inner forceps and the outer forceps. The forceps are replaced by ligatures and the raw surfaces left are covered over by the peritoneum of the broad ligament.

The above description applies to a comparatively simple case. Where there are extensive and dense adhesions the method adopted for the removal will depend on the local conditions as well as the skill and experience of the surgeon. In some instances, for example, removal of the appendages can be carried out satisfactorily only if a simultaneous removal of the uterus by subtotal hysterectomy is done.

Salpingostomy.—When the fimbriated ends of the tubes are sealed by salpingitis, which has subsided and left the tubes otherwise in a healthy state, the reopening of the tube lumen may hold out a prospect of pregnancy. An incision is made in the long axis of the tube about an inch in length. By appropriate sutures the mucosa is everted and stitched to the peritoneal coat of the tube.

CHAPTER XL

MINOR GYNECOLOGICAL PROCEDURES—DOUCHING AND TAMPONING

Vaginal Douching.—This is used for the cleansing of the vagina before an operation or for the relief of inflammatory conditions in the pelvis. Any mild antiseptic lotion may be employed, the most convenient being lysol (1 teaspoonful to the pint), corrosive sublimate (1 in 5000), or permanganate of potash (made up in a pink solution). The temperature of the lotion should be between 105° and 110° F.

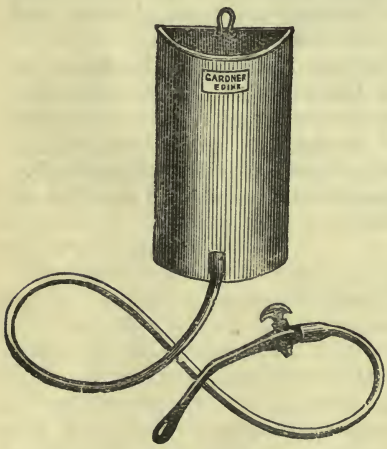

FIG. 182.—Vaginal douche-can, tubing, and nozzle.

For the satisfactory administration of the douche the following appliances are required: bed-pan, douche-can large enough to hold at least two quarts, 2½ yards of rubber tubing, douche nozzle (Fig. 182), bath thermometer, pail, and a square of mackintosh sheeting. Instead of the douche-can and tubing a portable arrangement like the "Rotunda" douche (Fig. 183) may be employed; it has the advantage of being easily carried in the physician's bag.

When faced with the need of giving a douche in the absence

of a bed-pan, the medical attendant will find that by arranging two or three pillows in a circle and draping the mackintosh sheeting over them a hollow space is produced in which the pelvis of the patient is conveniently placed. By suitably draping the overhanging part of the sheet into a pail a free douche can be given without the risk of the lotion overflowing

FIG. 183.—Rotunda siphon douche.

on to the bed. This is a specially useful procedure in dispensary and poor-class practice.

The douche-can, tubing, and nozzle are sterilised by boiling for five minutes. The patient then lies on her back at the near edge of the bed with her thighs and legs flexed. She is then placed on the bed-pan and the pillows are removed from her shoulders so that the pelvis is given a pitch. In this way

the fluid gravitates towards the fornices and the vaginal cavity is completely irrigated.

The patient being placed in readiness the attendant now places the lotion in the can, which is brought over near the bed. The end of the tubing and nozzle are meanwhile placed in the can to safeguard them from infection. The can is hung or held so that the head of lotion is about 2 or 3 feet above the level of the patient.

The vulva of the patient is cleansed, some fluid is allowed to run through the tubing and nozzle till the lotion is running hot, and closing the flow by temporarily occluding the rubber tubing between his fingers the doctor passes the nozzle within the vaginal orifice.

After the completion of the douche the attendant should pull back the posterior vaginal wall with his fingers to allow the fluid to escape completely. The patient's vulva is then covered with a pad of wool or a sanitary towel before she is lifted off the bidet.

Intrauterine Douching.—This is used largely in obstetric practice for the arrest of haemorrhage or for the cleansing of the uterus in cases of puerperal infection. In the former case the temperature requires to be very considerable; commencing at 115° it should be gradually raised to 120° F. Otherwise the temperature need be no more than 110°. Before introducing the nozzle into the uterus (Fig. 157, p. 293) a preliminary cleansing of the vagina for a few seconds with the running fluid should be carried out.

Vaginal Tamponing. — This is a method commonly employed for the arrest of haemorrhage from the uterus or cervix. In this case its action is largely mechanical and the more tightly the plug is introduced the more successful the result. Tamponing is also a valuable method of treating chronic deep-seated inflammatory conditions in the pelvis, *e.g.* salpingo-oöphoritis, parametritis, etc. In these cases it is employed in conjunction with douching. For this treatment the patient should be confined to bed. A vaginal douche is given in the evening and a tampon is then introduced and left overnight. In the morning it is removed and another douche is given. The same night a douche followed by a tampon is given. This routine is carried out daily for two or three weeks.

When employed for inflammatory conditions the tampon is soaked in an antiseptic. A convenient prescription is 10 per cent ichthyol in glycerine. For the plug an oblong sheet of wool about 12 in. long and 4 in. broad is laid on a flat dish and about 1½ ounces of the medicament is poured over it. The wool is then twisted into the form of a rope so that the drug permeates it completely.

The patient lies on the left side well over to the side of the bed with the limbs well flexed. By pulling back the posterior vaginal wall with the forefinger of his left hand the attendant opens up the vaginal canal. The plug is then pushed into the vagina, the fornices first being firmly packed, after which the remainder of the vagina is filled completely. The end to which the tape is attached is introduced last, the tape being used for the subsequent withdrawal of the tampon.

The plug promotes free secretion, and a thick pad should, therefore, be placed between the patient's legs. This is especially necessary if ichthyol is employed, as otherwise the bed-clothes will be badly stained.

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